TECHNOLOGY ADOPTION WITHIN UK RETAIL CONSTRUCTION: AN ANALYSIS OF THE TECHNOLOGY ADOPTION MODEL (TAM) ON ADDRESSING BARRIERS PREVENTING TECHNOLOGY ADOPTION AS A SOLUTION TO PRODUCTIVITY

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AN ANALYSIS OF THE TECHNOLOGY ADOPTION MODEL (TAM) ON ADDRESSING BARRIERS PREVENTING TECHNOLOGY ADOPTION AS A SOLUTION TO PRODUCTIVITY

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0.1 STATEMENT OF ORIGINALITY

I declare that this thesis and the contents within it are original work of the researcher, except where due acknowledgment and references are made to the origins of work. The original work has been produced for the purpose of this research thesis and has not been submitted to the university or any other platform previously.

Joseph Elliott

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0.3 GLOSSARY OF TERMS

Term	Definition
Building information modelling (BIM)	Building information technology (BIM) is the digital process involving production and managing construction projects in 3D methods, involving the integration of data and information throughout a project lifecycle.
Innovation	Innovation is defined as a new idea, practise, method or object that bring significant improvements or positive change and aim to enhance various aspects of a project.
Productivity	Productivity, relative to the construction industry is the measure of efficiency and output achieved, relative to the resource, time and effort expended. It is typically used within construction as a key performance indicator as it reflects how well resources are utilised to achieve a project goal.
Research and Development (R&D)	R&D within the construction industry refers to the efforts aimed at discovering, creating or implementing new technologies or methods to the overall benefit of a project.
Retail Construction Sector	Defined for the purpose of this research, the retail sector refers to the specific section of the UK construction industry that focuses on designing and constructing projects whose clientele and end-uses are that of retail activities. Such examples are; Retail stores, Shopping Centres, Retail Parks, High Street Developments, Pop-Up Shops, Mixed-use Developments, Food Stores and Warehouse Logistics and Distribution Centres.
Technology	Technology within construction refers to the application of advanced tools, techniques, systems and digital process to enhance aspects of a construction project. Technologies include many specific tools, but in general, consider all innovations and developments that improve a project aspect by way of advanced digital, mechanical or system processes.
Technology Acceptance Model (TAM)	The theoretical framework TAM, used to understand and predict the behaviours of individual end-users and stakeholders in the process of technology adoption. Created by Davis, 1989.
Technology Adoption	Technology Adoption within construction refers to the process of an organisation or project integrating a new technology or tool. The process for integration into the existing methods or processes is the technology adoption.
Technology Implementation	Technology Implementation refers to the uses of technology within an organisation or project to enhance the way in which things are done. Implementation is the final part in the process of integrating a new technology.

0.4 ABSTRACT

The UK construction industry has long been discussed for its low productivity rates and its slow adoption of technologies. This thesis looked to analyse key barriers that are preventing UK Retail Construction organisations from successfully adopting new technologies, in order to find a resolution to the productivity issues faced by the sector. The research utilised the Technology Acceptance Model (TAM) framework to explore relationships between the primary data and the literature review and provide recommendations to contractors and organisations in practise within the specific sector. Research was undertaken using an extensive literature review and primary data gathering to establish correlations between the two and understand the key barriers and potential solutions to the problem. The literature review found that productivity levels within the sector have continued to fall short against other sectors and industries, and using information from other industries, identified that technology adoption is a key solution to overcome productivity shortfalls. It then identified that within the UK Retail Construction sector, technology adoption also lags behind the industry curve. The research used a mixed-methodology approach to the primary data; using a quantitative online survey questionnaire and qualitative semi-structured interviews, with a triangulation method of data review. The findings from the primary data, aligned with the TAM framework and literature review, highlighted that within the sector, the key barriers to technology adoption are individuals preconceived perceptions of technology usefulness and ease of use, influencing the attitude towards technology and its adoption success rate. It was also found that external factors not directly considered within the TAM model and outside of individuals behaviours, impact the success of the technology adoption (heterogeneous constraints, costs, time, client influence). The review of the data against the TAM framework has provided the basis for recommendations that can be used in practise to improve technology adoption success rates. Such as the need to produce a clear business case for each technology adoption and communicate the business problem and technology solution with the stakeholders, to influence the attitude through the process. It also identified the need for organisations to identify the external constraints (time, cost, repeatability) on each case study and limit the adoption aspirations within these constraints. The research looked to impact existing literature by critically analysing the TAM framework against the findings from this specific field of research and has identified the need to consider such external factors. The conclusion chapter provided recommendations on ways in which policies and research can be addressed to overcome the barriers identified and provided considerations for organisations in practice and research academics for any future works.

0.5 CONTENTS

1.0 INTRODUCTION

1.1. INTRODUCTION

Within the introduction chapter, the thesis looked to establish the context of the research within the existing field of literature, whilst outlining the way in which the research would be progressed to develop the solution of the research problem. It does this by defining the rationale and research aim and highlighting the methodology that was used and what to expect from the thesis. The introduction chapter establishes the research problem and describes the way in which this thesis is structured to contribute to the field of literature.

The introduction chapter defines the research questions, the research aim and the research objectives, to provide the benchmark for the thesis development. The introduction provides a rationale for the research problem and also provides an outline for the way in which the research is carried out to achieve its objectives and provide findings and conclusions.

1.2. RESEARCH RATIONALE

UK construction, specifically within the Retail sectors is considered to have low levels of productivity, when compared to other sectors and industries. Figure 1.1 shows the labour productivity of construction, when compared to other sectors within the UK in 2015 (Farmer, 2016). In recent years, the UK construction industry has seen a large focus on the development and implementation of advancing technologies within the industry to combat these productivity issues (HM Government, 2022; Sertyesilisik, 2017).

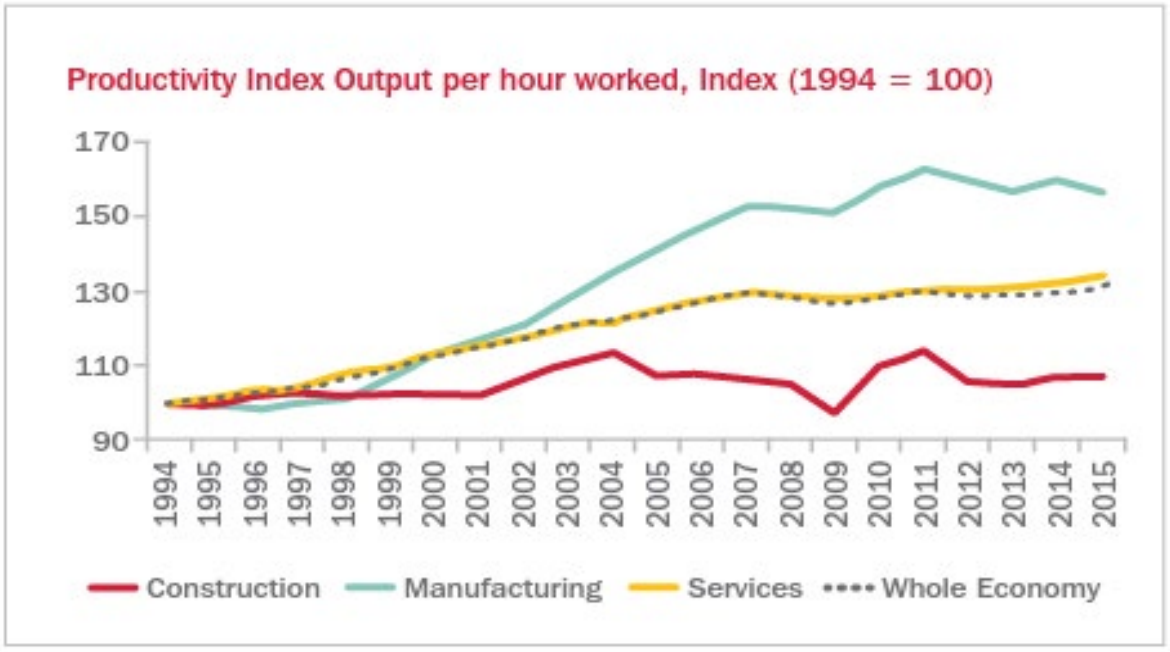


Figure 1.1; Productivity Index Output (Farmer, 2016)

One answer to increase productivity output in projects is to implement new technologies and promote innovation within the industry and sectors (Farmer, 2016). However, the technology adoption rate within UK construction falls behind the curve and is lacking when compared to other industries (Hargrave, 2017). There have been many advances which has driven the appetite for construction projects to utilise new technologies; whether it be advances in hardware, software, processes, manufacturing, on-site delivery techniques and technological aids (Loosemore, 2014). CITB (2018) - one of the largest construction training organisations in

the UK - carried out research within the UK construction industry reviewing the importance of technology adoption in UK construction, to combat the low levels of productivity, that impact the industry and its sectors. They deduced that there is a direct correlation between the low levels of technology adoption rates and the low levels of productivity seen across projects and sectors. This promotes the requirements for change and the necessity for UK construction to review the barriers it faces when trying to progress such growth by way of technology adoption.

The implementation of technologies is predominant within the current UK construction field of literature (Hargrave, 2017), with the leading discussions surrounding which technologies will prove most benefit to organisations and projects (Bygballe and Ingemansson, 2014; Loosemore, 2014; Dixit, et al. 2019). As part of this thesis, the adoption of technologies will be reviewed and will be discussed based on existing literature within the field of construction technology adoption, with key focus being on the barriers which prevent the successful adoption and implementation of new technologies. This research will look to focus on the retail sector within the UK construction industry, which is impacted most by the unsuccessful technology adoption rates and benefits of advancing technologies, resulting in the lowest levels of productivity seen within the industry (Farmer, 2016).

The primary focus on the utilisation of technology is to yield more efficiency and greater productivity within construction projects (CIOB, 2016). This focus has become one of the main discussion points within recent construction literature and has been a discussion for many years, with "*a vast amount of research into construction productivity stretching back over 50 years*"' (Loosemore, 2014, p.245). The growth of technology and direct impact on productivity and efficiencies in other industries has also put more pressure on construction firms to implement technologies due to growing client demands (Momade et al., 2022; Blayse and Manley, 2004). This pressure has also translated to Government policies, driving change within UK construction publishing new policies, focusing on the requirement for new technologies to be implemented in construction projects (HM Government, 2022). The focus on construction companies' technology adoption within existing literature has sometimes failed to consider the issues which constrain technology adoption at project and organisational levels within specific sectors (Skibniewski, Chao, 1992) and as such, this research looks to analyse and discuss the issues faced within the UK retail construction sector that contribute to technology adoption barriers, in the hope to provide recommendations to the industry.

Technology within the UK Retail construction sector, as defined for the purpose of this research, refers to the utilisation of advance tools, processes, automations, innovations and systems to enhance construction at any stage of a project, such as; design, planning, delivery, operations, manufacture, and management. There are many existing uses of technology within the UK Retail Construction sector, which will be analysed as part of this thesis' literature review.

From the construction delivery perspective within UK retail sector, constraints are increasingly becoming more demanding due to the imposition of the virtual market and the consumer demand to require more specialist customer experiences. (Elliott, 2018) This has resulted in reducing the requirement for physical retail space, but subsequently the demand for fast project deliveries, quality and efficiency has become more important factors for clients, who's perception that new technology must increase productivity and reduce costs. But with limited project budget and lack of knowledge and training, this can significantly constrain suitable and effective project innovation and implementation of technologies and instead promote loose change that does not contribute effectively to organisational benefits (Loosemore, 2017).

For the purpose of this thesis, The UK Construction Retail Sector is defined by the area of projects in which the design, planning, development, manufacture and delivery of construction specific projects relate to retail related structures, facilities and clients. This predominately constitutes of various types of projects whose end users are typically of a retail nature, such as shops, stores, supermarkets, shopping centres, departments stores and offices relating to clients whose business involves selling such goods and services to customers (Construction Index, 2018). Typical projects involve, retail shops and buildings, interior fit-out of new shops,

refurbishments and upgrades of constantly developing existing shops, mixed-used developments such as offices and shops and even logistics and warehouses which are associated with retail clients. The UK retail construction sector is influenced by factors such as the national economy, customer behaviours, planning regulations and more recently the trends of technology and social medias (Seidu, Young et el., 2021).

The benefit of implementing new and advancing technologies on projects can be seen, where innovations can aid in on-site activities and drive efficiencies in the management or delivery process. Bygballe and Ingemansson (2014, p. 512) stated that their research "*shows that construction companies primarily innovate in relation to how to plan and manage projects, how to organize the construction process, and how to handle clients and other counterparts*." This implementation of innovations and advances in technology can aid a contractor to secure work and deliver a project more efficiently by improving management productivity, but without fully understanding the constraints on construction projects it can be difficult to fully understand the barriers when trying to adopt new technologies. This can subsequently lead to adoption failure rates higher in sectors where constraints are more volatile, and projects follow a more heterogeneous profile. The UK retail construction sector predominately includes projects that require adaptation of existing buildings or constraints by existing parameters, fast paced delivery periods, low budget portfolios and high margin erosion and risk profiles (Pike, 2015). These constraints are key factors when understanding the issues faced in technology adoption within the sector, as they contribute to the barriers faced by organisations who look to adopt and implement the new and advancing technologies.

Researchers have discussed the issues faced within the UK construction industry and its' low rates of productivity growth, with the UK government initiating research to identify the shortfalls of the UK construction industry and recommendations to combat the issues faced (Dixit, et al. 2019; Loosemore, 2017; Whiteside and Whiteside, 2006). When the productivity levels are compared to other industries - which adopt advancing technologies and see direct correlation with increasing productivity – construction as an industry falls behind other industries, such as manufacturing and plant (Farmer, 2016). Within this discussion, the retail sector also then falls behind the general UK construction industry as a whole (Hargrave, 2017). However, when reviewing the existing literature on retail construction productivity and adoption of technology, it is seen that there is a gap in this field of literature specific to UK retail sector. It is this area of research, that this thesis looks to contribute to knowledge, by providing analysis of the research data and providing discussions and recommendation to organisations for industry use, to close the gap in literature.

1.3. TARGET AUDIENCE AND RESEARCH PURPOSE

The intended target audience for this thesis is construction organisations within the UK retail construction sector. Whilst the adoption of technology within businesses has been widely discussed in existing literature, (Arayici et al., 2011; Peansupap and Walker, 2005) the adoption of technology within the UK retail construction sectors and the barriers which are preventing technology adoption to facilitate higher productivity has not been widely discussed in construction fields of literature. As such, this thesis also looks to provide data analysis, discussions and conclusions which will help future researchers to develop upon this specific field of literature; of UK retail construction, a niche sector that has many significant challenges and constraints, that whilst may be present in other areas of other sectors, widely dictate how organisations and projects can perform and limit the possibilities in a way that other sectors are not so restricted (Bakry et all., 2014, p. 145; Pike, 2015).

Within the industry, the barriers and issues faced by organisations and projects continue to prevent them from fully utilising new and advancing technologies (Hargrave, 2017). This thesis looks to provide recommendations to the industry organisations based on the research findings. By providing conclusions from the findings of the literature review, data gathering and review against the TAM model, this thesis looks to provide contractors with recommendations to aid them in future technology adoption processes.

The Technology Adoption Model (TAM) (Davis, 1986) is widely recognized as a both a well utilised theoretical and conceptual framework in literature for its simplistic approach (Ajibade, 2018). The TAM model, which is reviewed in detail further in this thesis, is renowned for its simplicity and focus on behaviour and practical implications to provide an effective framework for research on technology acceptance. Maxwell (2013) discusses how Conceptual and Theoretical frameworks can both be used in research to impact the theoretical academic findings and the practical real-world outcomes. For the purpose of this thesis, the TAM model will be used as both the Conceptual Framework; looking to apply its framework to real-world practise to provide recommendations and conclusions in practise. It will then also be utilised as a Theoretical Framework; to consider the existing a future literature and theoretical implications of this research to impact the academic field. Part of the discussion and conclusions of this thesis will look to critically review the TAM framework against the theory and academic literature and also against the realistic approach of its use in practise within this field of discussion.

The findings and conclusions would look to be utilised in the UK retail construction industry, for use by contractors and projects utilising the TAM model to implement technology adoption for successful outcomes. The findings of this thesis, looking to analyse the use of the TAM model in the sector will provide relevant recommendations for contractors. From the findings and recommendations of this thesis, it looks to influence future policies both for the wider construction industry, and specific to the retail sector. By influencing the technology adoption process and increasing success rates, it will allow for industry and organisation policies to benefit from technology adoption to aid in achieving policy strategies or targets.

1.4. RESEARCH QUESTION, AIM AND OBJECTIVES

RESEARCH QUESTION

What are the key barriers preventing UK Retail Construction organisations from successfully adopting new technologies to provide solutions to increasing productivity, and can analyse if the theoretical framework; TAM, be utilised by organisations to overcome these barriers and increase technology adoption, to combat low productivity levels?

RESEARCH AIM

The aim of this thesis is to analyse technology adoption within the UK Construction Retail sectors and identify key barriers which are preventing successful adoption and implementation of new and advancing technologies. It will then look to analyse primary data gathered from interviews with experts, and online surveys to try explain why firms are failing to adopt technologies at a similar rate as other sectors or industries.

The thesis will use the Technology Acceptance Model (TAM) (Davis, 1986) to analyse the data to explore relationships between the primary data gathered and the criteria within the TAM model to provide recommendations to contractors to overcome key barriers and potentially provide solutions for successful technology adoption to benefit productivity.

RESEARCH OBJECTIVES

The objectives of this thesis will be;

- To investigate the productivity issues in UK construction, looking specifically at the UK Retail sector, and review the impact that technology can have on these issues.

- To identify how specific technologies are being utilised as tools to benefit construction organisations and projects to increase productivity.

- To identify key barriers in technology adoption within UK Retail Construction
- To use the TAM model to provide recommendations on how organisations can overcome the identifies barriers to result in successful technology adoption.

1.5. THESIS OUTLINE

The introduction to the thesis provides rationale to the research, whilst also identifying the research question, aim and objectives that define the research outcomes. This section looks to identify the target audience for the research and the purpose of the thesis.

The second chapter is the literature review section of the thesis, which comprehensively reviews literature from the most appropriate and acknowledged sources available. The literature review covers the basis of the thesis by looking to achieve the research objectives utilising the existing field of literature. The purpose of the literature review is unbiased, looking at considerations for and against each discussion point providing the research with the most well-rounded and informative discussion possible for each element of the objectives.

The research methodology focuses on the strategy and design of the data collection, reviewing existing methodology approaches utilised by other researchers in similar fields of research. It outlines and identifies the process of data collection, considering the information required and the methods to obtain this information. Within the methodology chapter, it discusses the available methods of gathering the data and concludes with the preferable strategy for the discussion topic.

The fourth chapter of the thesis identifies the preliminary findings of the data collection from the chosen methodology as outlined earlier in the thesis. The research findings are clearly identified along with the process that has been followed to identify these findings. Where reference should be made to statistical analysis and models, this has been identified and clearly shown within this section. It is the main purpose of this section to clearly identify the raw data gathered from the primary research methods, with no commentary against the findings, this section purely identifies the data.

The discussion section of the thesis collates and reviews all the previous sections to form suitable discussion against the aims and objectives, looking at the data gathered against the literature review section. As part of the main objectives, the discussion section looks to use the findings from the data collection and analysis to provide any relevant discussion either for or against the thesis subject and objectives. This section takes the data as identified in the previous chapter and analyses the findings against the literature review in the lens of the TAM theoretical framework, to discuss the findings against the thesis question, aim and objectives. Where the thesis aimed to provide a recommendation, this section has outlined any recommendations against industry, policy and academic change.

As part of the main objectives, the final section uses the findings from the data collection and analysis to provide any relevant conclusions either for or against the thesis subject. Along with conclusions, this section answers all the key questions put forward within the introduction and provides relevant conclusions for all the information gathered throughout the thesis. Within this section, there is a suitable narrative as to how the outcomes, aims and goals of the thesis are addressed.

1.6. SUMMARY OF THE INTRODUCTION

The introduction chapter has outlined the research question, aim and objectives, being relative to the technology adoption within UK Retail Construction and aiming to identify the key barriers preventing successful adoption. An outline of each chapter has been set out to ensure the thesis

remains structured. Within the introduction, the research rationale, target audience and purpose for the research have also been identified as contractors and researchers within the field of technology adoption in UK Retail Construction sector. The key items identified within the introduction will be the basis for the outcome and success of the thesis.

2.0 LITERATURE REVIEW

2.1. INTRODUCTION TO THE LITERATURE REVIEW

In the ever-evolving landscape of the UK retail construction sector, the implementation of technology has emerged as a pivotal driver of progress (CITB, 2018). As retail demands continue to shift, fuelled by changing consumer behaviours and expectations, construction practices must adapt to ensure the timely delivery of innovative and functional retail spaces (Elliott, 2018). Despite the evident benefits that technology adoption promises in enhancing construction productivity, the sector has shown a degree of reluctance in fully embracing these advancements.

This literature review looks to delve into the issues and potential surrounding technology adoption within the UK retail construction sector. With a specific focus on identifying barriers that currently prevent successful adoption of new and advancing technologies, as well as any potential these such technologies have for increasing productivity through technological implementation. This review aims to provide insight on the potential factors that prevent progress through the sector. Furthermore, this study seeks to explore the barriers and potential solutions through the lens of the Technology Acceptance Model (TAM) as a theoretical framework to understand and resolve these barriers. By examining a wide spread of existing literature, empirical studies, and case analyses, this review endeavours to provide valuable insights into how the UK retail construction sector can overcome its technological adoption barriers, providing a potential for the sector to utilise technology to increase productivity.

2.2. UK CONSTRUCTION PRODUCTIVITY

Productivity is a key factor in determining an industries output and contribution to the overall economy. For organisations, it can determine how successful they are within the industry and can be a contributing factor to how competitive and successful they are (Ness, 2010). The office for National Statistics (ONS) states the importance of productivity in their overview of economy. Stating that the understanding of productivity of a sector is necessary to understand potential growth, competitiveness and contribution to the overall economy. They state that construction "*has long been thought to have a lower level of productivity than comparable industries, and slower growth in productivity relative to the rest of the economy*" (ONS, 2021, p. 1). In their abstract to yearly statistical findings, ONS continue to discuss the importance of productivity within the construction industry, and the subsequent importance of construction on the overall national economy.

Within UK construction, no sector is less constant and more heterogeneous than the retail construction sector; where the vast majority of projects are undertaken within existing buildings, with different stakeholder requirements and project constraints, which impose specific and new parameters to each project, that can be dramatically different from one project to another. This results in new approaches to design, build and management techniques being required for individual projects, relative to the specific problem at hand (Bakry et all., 2014). This heterogeneous approach to projects results in efficiencies being hard to replicate, resulting in productivity seemingly appearing lower (Hargrave, 2017).

In 2016 the government commissioned the 'Farmer Review' (Farmer, 2016), which was an in-depth analysis into the productivity and current situation of the construction industry as a whole, within the UK. A key theme within the report finding was the construction industries' lack of productivity and lack of R&D and innovation. One of the root causes that it identified for the lack of innovation was that "*the industry has deliberately evolved a 'survivalist' shape, structure and set of commercial behaviours in reaction to the environment in which it operates"* (Farmer, 2016, p. 42). This survivalist mentality imposed on contractors and the pressure to minimise profit margins and increase competitivity is one of the reasons that organisations see low

success rates in technology adoption. This is especially the case in UK retail construction where there is no room to risk costs against new technologies when constraints are so tight on a project (Seidu et al., 2021).

The government have also published policies in recent years which outline the requirement for construction organisations to drive technology adoption, again looking to benefit the industry with increased productivity as a result of this. The 'Construction 2025: strategy' (UK HM Government, 2013) is one of the key policies that the Government refers to and identifies as a long-term strategy. It is imperative for the Government to endorse the success and productivity of construction, due to its direct bearing to the wider national economy. (HM Government, 2013, p. 16) and states that a key factor in doing this is to promote 'smart technologies' being utilised more. Figure 2.1 below, shows a model that the government has published to help contractors to incorporate new ways of working with technology.

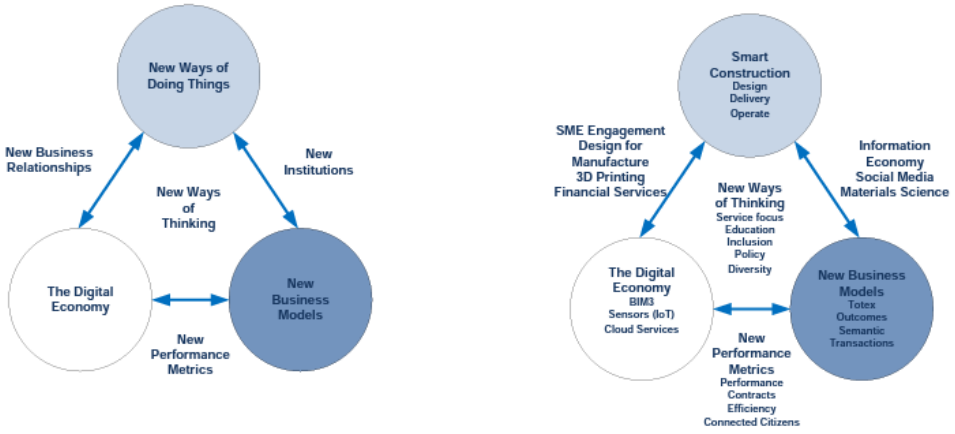


Figure 2.1; Business Change Model (HM Government, 2015)

Although there is suitable policies and government driven targets in place, there is an underlying issue that prevent organisations from adopting technology (Farmer, 2016). As a result of the barriers faced and changing project parameters, the comparison between industries has always identified construction at a much lower productivity rate. The graph in Figure 2.2 shows that within the overall economy of the UK, construction levels of productivity fall below the average for the rest of the economy. The Office for National Statistics (2021) discuss in their statistical analysis report that the UK construction industry average productivity levels have remained constantly below the wider UK Average across all industries. It is this deficit, where it is believed the increase in technology adoption will have a direct positive effect on the sectors and industry in general (Bygballe and Ingemansson, 2014; Loosemore, 2014).

An example of where government driven technology adoption has occurred is with the BIM Mandate 2016, which required all new public sector construction projects to utilise BIM Level 2 by 2016 (UK Gov, 2017). The outcome of this mandate was targeted at the Government controlled projects, with the intention that the technology adoption would increase across all sectors by way of osmosis and transfer of benefits (Awwad et al., 22). However, the results were quite different, with the BIM Mandate being considered to many as a failure with not all projects implementing BIM by the deadline imposed within the public sector. Within the retail sector, BIM is still not fully integrated in 2023 and again could reflect against the over optimistic approach by the government to drive such change. There are many reasons why this change did not meet the targets (Mahamadu, Mahdjoubi and Booth, 2013), however, the learnings from this can include the lack of understanding of barriers in technology adoption through the sectors.

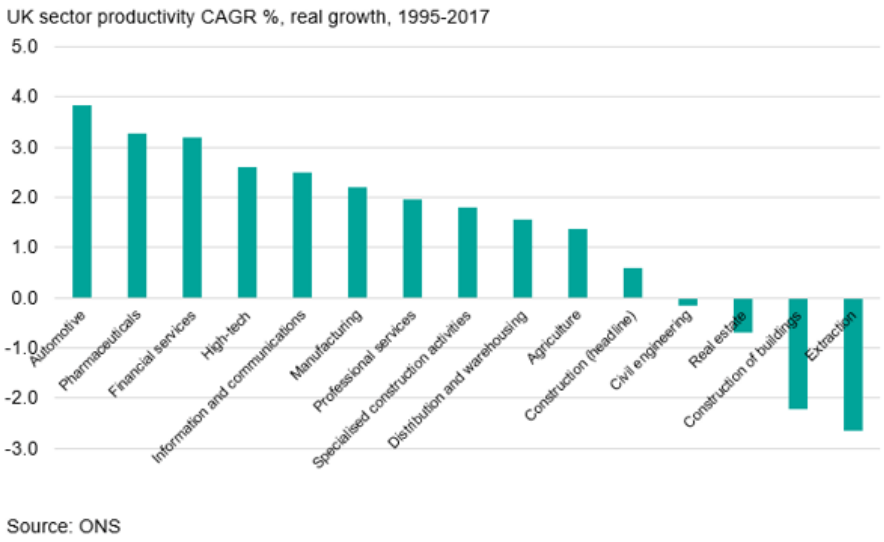


Figure 2.2; UK Sector Productivity Real Growth (Office for National Statistics, 2017)

In an article on productivity, Hargrave (2017) discusses how "*construction is perceived as a laggard – especially when potentially unfair comparisons are made with the automotive or manufacturing sectors*". This discussion of productivity in construction has been debated for many years with the specific heterogeneous challenges that construction face, being recognised as a contributor to inefficiencies and lack of productivity, especially when compared to the other industries (Blayse and Manley, 2004; Bygballe and Ingemansson, 2014; Hargrave, 2017; Loosemore, 2014; Sertyesilisik, 2017; Skibniewski, Chao, 1992). To fairly compare construction against other industries, the key factors of determining productivity in construction must also review the nature of projects and constraints imposed, versus the constraints seen in other industries, to truly understand the impact on productivity these have and deduce a fair comparison (Hargrave, 2017).

It is this discussion on the specific nature of construction and the impact that project constraints have on technology adoption success factors, that this thesis will look to review more closely, specifically considering the constraints of UK retail construction. As it is believed that if the technology adoption rates can be improved, the productivity levels could subsequently follow (Loosemore, 2014), this thesis will look to identify where technology adoption can combat low productivity, but will focus more on the key barriers that prevent successful technology adoption within the sector and will aim to recommend how organisations can overcome such barriers to more effectively adopt technologies and increase productivity.

2.3. TECHNOLOGY ADOPTION AND IMPLEMENTATION

2.3.1. TECHNOLOGY ADOPTION PRINCIPLES

Straub (2009, p. 625) describes technology adoption as "*a complex, inherently social, developmental process", stating that "individuals construct unique yet malleable perceptions of technology that influence their adoption decisions*". This complex process development has been seen to typically fall short in the construction industry where new technology adoption has seen a lull when compared to other industries (CITB, 2018; Farmer, 2016; Lai, 2017; Loosemore, 2014; Mitropoulos and Tatum, 1999; Samad et al., 2018). It has also been discussed that this phenomenon of low technology adoption rate is a contributing factor to the low productivity rates in the construction industry, again when compared against other industries (Pan, 2018). Whilst there has been previous research into the wider constraints of the construction industry and the challenges the industry faces in technology adoption and innovation (Arayici et al., 2011; Peansupap and Walker, 2005), this research aims to

specifically look at the UK retail construction sector and looks to provide recommendations to the issues that have been identified both in the literature review and data gathered.

Technology adoption is the ability to engage and utilise technology to the benefit of its purpose (Straub, 2009). The adoption of new and advancing technologies can benefit a business to give it a competitive edge over other businesses or provide it with an advantage to improve existing performance. This process can be a key factor to allow businesses to evolve and grow to survive (Lai, 2017; Brandon and Lu, 2010; Straub, 2009). There are many factors that can influence a business' ability to adopt technology and utilise such changes for its own benefits. These factors are widely discussed within technology adoption research with defining concepts being regularly used to understand the dynamics of technology adoption theories (Venkatesh et al. 2003).

With the increase in new and advancing technology growing at an exponential rate in recent years, there has been a lot of speculation within the construction industry, with professionals posing the question that if technology increases and construction can adopt new ways of working to utilise the advancements, then surely productivity must follow suit and see positive growth in productivity (Ness, 2010). With many debates ongoing throughout the field of literature, there are many direct claims that technology is the answer to increase productivity in construction (CITB, 2018; Farmer, 2016; Hargrave, 2017). Novotny (2019) claims that "*technology is one of the easiest ways to make smarter business decisions and improve productivity in construction more so than other industries*". Novotny proceeds to explain that it is the business models and lack of successful adoption and utilisation that is preventing technologies from directly improving productivity in construction companies and not the advances themselves, which – if implemented correctly – would return better productivity. (Novotny, 2019)

It has been widely discussed in research that the implementation of technology will benefit productivity, efficiencies and general project success throughout the construction industry (Farmer, 2016). The use of technology as its advances should only advance the techniques and methods of construction. However, the adoption of technology into construction projects has not been as effective as other industries, which has seen similar advances in technology. As discussed, this introduction and adoption of technology has many barriers that can affect the successfulness of the adoption, especially when considering the constraints and external factors considered within the UK Retail Construction industry and the organisations within it. As well as external factors that can influence the rate of adoption of technology, changes can often be blocked during the process of technology adoption by individuals through decision making hesitance, lack of implementation and rejection to new methods or ideas (Davis, 1986).

2.3.2. Labour and Skills

Construction as an industry is heavily reliant on its labour workforce, when considered against other industries where technology has taken over as one of the main reliance factors, as seen in manufacturing and IT industries. In total, the construction industry employs 1.4million workers (excluding all self-employed workers) (ONS, 2021), which all have an impact on the process of technology adoption, whether they are key stakeholders, decision makers, or end users. Ness (2010) discusses the factors that influence overall change and contribution by employees.

> *"[construction] workers are taken on and shed with the business cycle. The work is often seasonal, insecure and carried out in difficult working conditions. Construction workers must move from place to place as the work moves around and move from contractor to contractor depending on which bids successfully for work*." (Ness, 2010, P. 1)

This insecurity of position and work can heavily contribute to the lack of willingness to introduce new technologies and provide blockers when organisations try to adopt technologies through their processes or on a project level.

When compared to other industries, where organisations have employees that they can see the direct benefit of new technology adoption and training can be planned both immediately and through passed knowledge, the construction industry workforce results in a lack of shared knowledge from project to project, with constantly changing project constraints to consider, which inevitably affect the successfulness of any attempt for new technology adoptions. This can then make it difficult for individuals to understand the perceived benefits of new technology when reviewing potential or looking at adopting a new technology (Dulaimi, 2007). This again is a contributing factor to the lack of implementation of new and developing technologies and the introduction to innovations.

At the heart of every business case to adopt or reject certain technologies, the fundamental tipping point typically comes down to a single or collective decision-making process, whether this be for an individual project or as an organisation wide adoption. Gu, Li et al. (2015, P. 471) states that "*In order to make reasonable decision, decision makers usually acquire from others in the local environment, i.e., social learning*." They discuss the social and observational components that affect decision making when considering implementation of technology. When this is considered again the wider construction industry, it can be seen that the attitudinal and cultural behaviours of differing sectors can have drastic fluctuations on the way in which each sector is managed, including decision making within the individual sectors.

2.3.3. HETEROGENEOUS CONSTRAINTS

The fast-paced changing environments of UK Retail Construction, with the changing supply chain and constraints, causes a much more complex culture within the sector, resulting in a more challenging process to adopt and implement change. The way in which the different sectors approach technology adoption methods vary vastly depending on the success deliverables and sometimes project demands or constraints. An example of this is within new build housing developments, which have completely different constraints and methods of management to typical existing building refurbishment. This can result in cultural differences throughout the project lifecycles, from pre-construction right through to project handovers (Construction Index, 2018). These cultural differences can have an impact on the attitudes of organisations and individuals within each of the sectors and in turn will affect the decision-making process in different ways.

Specifically, within the UK Retail Construction sector, the variance of project parameters and constraints further adds to the complexity of the requirements and the heterogeneous approach that is derived from the projects. This adds further barriers to the technology adoption of companies. The different types of projects within the sector, from shopping centres, high street stores, new builds, logistic centres and refurbishments of predetermined builds, add to this difficulty in wholesale and uniform approach to technology adoption and implementation.

The factors influencing decision making to allow for implementation of technologies also reaches beyond the constraints of the UK construction industry, with external factors and stakeholders impacting decisions. Pries and Janszen (1995) discuss the way in which the construction industry in general relies on the wider environmental factors to allow for change and innovation within the industry. They state that "*in particular for builders, a clear relationship with their environment is shown. When these external circumstances are positive the industry is apparently very capable of innovation*". They discuss the requirements for innovation within the construction industry and the factors blocking the progression of innovation being predominately external, such as financial climates and national circumstances.

2.3.4. COVID-19 IMPACT

This external impact can be seen in recent years with the Covid-19 pandemic having a significant impact on all industries within the UK. The UK construction industry was affected by the pandemic and saw that;

> "*productivity in the construction industry was volatile during 2020, as the industry was greatly affected by the coronavirus (COVID-19) restrictions in response to the pandemic. Taking the year as a whole, output per hour was 2% higher in 2020 than in 2019, as output fell less than hours worked. This was particularly notable in the specialised construction activities sub-industry, where output fell by 16% and hours fell by 20%"* (ONS, 2021).

This drastic fall and rise in output, with uncertainty on future works results in organisations carrying out less changes to known company procedure such as technology adoption.

When reviewing the impact that the Covid-19 pandemic had on the wider technology adoption scenarios, there were instances where organisations had no choice but to adapt to the unprecedented climate and utilise technology to change working behaviours to continue to progress (Pierri and Timmer, 2020). These technology adoptions were required for both organisations and people to survive and continue in their work and personal lives. In peoples' personal lives, they were required to sign up to contact tracing apps, or digital vaccination passports and in both personal and professional situation there was a required increase in online meeting platforms such as Zoom, Microsoft Teams and Google Meets (Robinson and Johnson, 2021). This necessity to implement new technologies in everyday life resulted in a much higher rate of technology adoption, as people became more receptive to the necessity of technology, both in everyday life and in work environments. This resulted in a cultural and behavioural increase in technology adoption which is believed to still be seen now with technology adoption being more widely successfully adopted as a result (Pierri and Timmer, 2020)

2.3.5. ATTITUDES AND PERCEPTIONS

The attitudinal factors that influence the adoption of new and advancing technologies also plays a significant part in allowing technologies to benefit projects and organisations, or blocking them by way of unwillingness. Dulaimi (2007) discusses that "*there is still a significant section of the industry who feel that R&D and innovation is limited to a narrow section of the industry*". The idea that for certain sectors of the industry, technology cannot benefit projects and therefore should not be adopted, is one of the contributing social or behavioural factors to be considered as to why technology has not been implemented as effectively as other sectors and other industries, which furthermore contributes to the productivity issues facing the industry.

The social interactions between professionals and tradesmen in construction projects and companies is imperative for the social learning aspects that are required for the effective adoption and implementation of new technologies across projects. Pata et al. (2016) discussed that "*The empirical studies from the project [they investigated] revealed that requesting for help from other experts and actively searching people or documents to find a relevant source of knowledge are common to construction professionals' practices*". This interaction between people within the industry can be accountable for the overall way in which technology is effectively adopted and utilised or can be considered as a reason why such technology adoption is sometimes blocked. Pata et al. (2016) further discuss that they had "*observed how experienced craftsmen are sometimes reluctant to new knowledge, especially when it is brought to them by younger colleagues*." This observation is one of the factors in technologies not being fully integrated into construction projects, due to attitudinal behaviouristics causing barriers in adoption and implementation. The attitudinal aspects of retail projects and organisations, which are predominately led by senior management who utilise their knowledge and experience to work within building constraints, is the same consideration, looking at the unwillingness to change working ways to utilise a new technology for the potential benefit to the project (Pike, 2105).

2.3.6. CLIENT INFLUENCE

Another significant factor in the way in which technology is adopted into projects and wider frameworks is through the client decisions and behaviours. Yisa et al (1996) discussed the importance of client involvement, especially when dictating how a contractor can procure and deliver a project. They state that "*with the traditional method [of procurement], the client and/or his advisers draw up a specification and, in some cases, even go as far as suggesting what materials should be used*." They discuss that this influence on how a contractor should procure and tender a project applies constraints on projects from the start that can, in many cases, restrict the projects' ability to innovate or introduce new technologies. This initial confinement and focus on competitive costings develop a behavioural relationship between clients and contractors that sees no introduction or allowance for growth of new ideas and technological advances, but instead shuns them for the fear of losing future works or impacting either profit or cost certainty.

2.4. THE UK RETAIL CONSTRUCTION SECTOR

The Retail construction sector is a specialist sector within the UK construction industry, the sector has many constraints and individual project parameters that are more heterogeneous and volatile than other sectors, typically being defined by the physical building constraints, client expectations and demand for low-cost budgets (Seidu et al., 2021). The retail sector as generalised by this research parameters is defined predominately by the refurbishment type projects, working within existing buildings constraints. The nature of retail construction is typically difficult for contractors, with high pressure demands on minimalistic programmes, tight budgets and predominantly bespoke nature designs and complex builds. Projects rarely occur over multiple iterations of the same constraints, despite its repeat work nature and framework suited culture. The construction Index (2018) described the retail sector as being "*a cut-throat business with traditionally fierce competition and relatively high risks*." It is these factors that draw the retail sector out as an individualistic sector that should be considered outside the usual context of general construction when analysing the productivity and technology adoption rates.

Pike (2015) described the issue of refurbishment retail or fit-out projects, stating that;

> "*with new builds, everything is under control: you're starting from scratch so have better foresight over potential hurdles. But fit-out is a different beast. A fit-out company is unlikely to be working in a never-before-used space, and when you're refurbishing a building that may have been around for some time, or has been refurbished multiple times before, you'll face an entirely new set of challenges*."

For contractors, this is an example of where costs are kept to a bare minimum and the decision to explore new technologies is rarely taken, due to the high risk on margin or reputation of doing so. Clients within the industry are cost and programme driven, sometimes with little consideration for innovation or working outside the 'tried and tested' models in the fast-paced sector (Bakry et all., 2014). The integration and adoption of new technologies within construction projects on existing buildings is a continual issue that the industry faces with progression lagging behind similar tools being utilised in new build construction (Araici et al., 2017).

This constant change in the project parameters and different types of projects can lead contractors to being extremely versatile and adaptable, but also limited in their process and use of project delivery and management techniques or technologies (Lee et al., 2003). Contractors within the UK Retail Construction sector can see projects varying from small high-street retail outlets - comprising a small fast paced timescale that has significant time constraints. Where pure retail clients can drive the need to be finished on time, imposing significant penalties

should this not be achieved. The next project could see works being carried out on shopping centres, where the drive and focus is more around quality or efficiency due to the larger scale of the projects and the need to coordinate multiple smaller projects. Finally, they could then see distribution centre work for clients where the large scale, but small cost can drive the focus on efficiency on delivery and cost, where every penny is challenged and constrained on minimal rates applied. This dynamic model, where contractors should adhere to such changing requirements and constraints from project to project, result in contractors being extremely heterogeneous in their approach to project management, delivery and the tools and techniques they use, to ensure adaptability is maintained (Pike, 2015).

The way in which contractors have evolved to make the most out of this demanding sector is through maximising the benefits of repetitive work streams, formulising a methodology of project delivery and repeating this model with little or no change to maximise efficiencies and make what margin they can (Crompton, 2016). Repeat clients with similar design goals or repetition throughout a single project can result in a learning curve which allows for contractors to maximise on profit and efficiency for the next projects with the same client or initial project briefs, only then needing to adapt to the physical project constraints (Seidu et al., 2021). It is here where contractors are looking to optimise productivity to increase profit, but also here where risk lies in implementing new or untested methods, which - for such a competitive market - leaves contractors' little room to explore new technologies, through risk of losing work. Bakry et all. (2014, p. 145) discussed within the sector, that "*maintaining work continuity forms an additional constraint when planning and managing repetitive projects*." They describe the impact that repetitive work streams can have on a contractor's management process, which leaves no room for change as the works are planned with minimal contingency for error, based almost entirely of experience from previous projects and learnings from issues or opportunities. This experience led planning technique lends itself to little or no new technology or methods, as it relies on personal decision making to take risks on something new and initiate a change in a culture that benefits of the 'tried and tested' approach.

In recent years the retail sector has seen a vast change in its approach, with more retail stores opting for a more experience driven approach to attracting customers, resulting in the design of bricks and mortar stores adapting to suit the growing online presence (Elliott, 2018). This change in approach has seen an evolution of client procurement of retail construction and combined with the impact that the Covid-19 pandemic had on physical retail, has naturally seen retail construction clients drive for more innovation or technological advanced builds to promote the changing environment and achieve the evolving targets, such as innovative products and sustainability requirements. However, this has also seen to drive tighter budgets and adopt a less risk approach, in turn making it more difficult for contractors to implement new methods or technologies and fall back on the approaches they know and understand from experience (Seidu et al., 2021).

2.5. Overview of Technologies in UK Retail Construction

The advances in technology continue to benefit the construction industry in multiple ways across many disciplines (Farmer, 2016). As technology improves, costs for such innovations readily decreases and typically user interfaces become more user-friendly and practical to the common users, without the need for extensive specialist workers and training being required (Lai, 2017). Construction has shown in the past its ability to utilise new and advancing technology to showcase its benefits, with particular attention on large scale projects where it can increase client engagement throughout the process (Wiper, 2012). Within both the academic community and within the media, there is attention on such technologies and the excitement they bring to the potential of future construction projects (CITB, 2018; Farmer, 2016; Lai, 2017; Loosemore, 2014; Mitropoulos and Tatum, 1999; Samad et al., 2018).

The implementation of technology has many benefits to organisations and projects within construction, but typically some of the key benefits are; (Novotny, 2019)

- Increased productivity
- Greater quality control
- Improved communications
- Improved H&S considerations
- Increased efficiencies
- Further resilience
- Improved risk mitigation

With this large surge of technology and the benefits it can bring, the commercial factors of competition can easily distract from the real tangible change. Skibniewski and Chao (1992) discuss that "*It is difficult to quantify the intangible benefits of advanced construction technologies and the risks involved in implementing such technologies with the use of traditional economic analysis techniques*". This difficulty in analysing and quantifying the benefits allows technology companies to adapt perceptions to their favour, to win new clients from competitors. This public advertising can quickly dilute the realistic advantages of what technology can bring to a project. Where outselling rival companies can produce ambiguous or over exaggerated claims and promises of what the technology can provide.

One of the key considerations of technology adoption and implementation in recent years has been the drive for the effective growth and utilisation of Building Information Modelling (BIM) within the UK Construction Industry (Lam et al., 2017). BIM has been discussed for many years, with the full potential not being fully utilised through the entire industry (Farmer, 2016). As technology develops the BIM potential also develops, with its potential to bring construction projects into a more technological based process through all stages of a project (Armstrong, 2015). In 2016 the Uk Government introduced the 'BIM Mandate 2016', which drove the inclusion of all new public sector construction projects to utilise BIM Level 2 by 2016 (UK Gov, 2017). This was a clear example of how the change and adoption in technology was being used to focus the drive on efficiencies and productivities in construction. It was also a good example of how different barriers in technology adoption, through different sectors of the industry posed different challenges and outcomes from the mandate. Whilst in some of the large-scale development sectors and public sectors driven by KPIs, the BIM Mandate was reasonably successful, in other areas and sectors such as the retail sector or where BIM is integrated into existing buildings, BIM is still yet to be entirely adopted and continues to lag behind (Arayici et al., 2017).

One aspect of construction that has come to the forefront in recent times within both the construction industry and the wider UK economy is how technology can be utilised to provide resilience. (Maali et al., 2020; Riley, 2018; Rogers, 2017; Zhao, 2020) The focus of resilience has quickly evolved in recent times due to the pandemic; Covid-19, which pushed UK industries to instantly adapt to government guidelines preventing any non-essential travelling and posing a lockdown restriction on the country. The overriding principle of this was to limit face-to-face contact and establish social distancing, preventing the spread of the virus between human-to-human contact. The significance of these restrictions was that many industries, including construction, came to the realisation that there was a substantial reliance on physical interactions, both on the production side and the management side of the industry (Culnane et al., 2020) and this needed to change to overcome the pandemic restrictions. It was this intervention that shone a spotlight on the way in which organisations interact using technology, through the processes of delivering projects and managing business requirements. Sertyesilisik (2017) stated that "*new technologies can be used to enhance disaster resilience performance of the construction industry*". Sertyesilisik discussed the advantages of technology and its

versatility when in a crisis, to help both prevent the impact of a disaster and also to aid in the recovery post-disaster.

One of the key beneficiaries to aid in both the impact prevention and the recovery of the 2020 Covid-19 pandemic was the utilisation of technology to provide virtual meeting platforms and limit the physical exposure of human contact with each other (Culnane et al., 2020). At the time of the pandemic in 2020, the technological infrastructure within the UK had developed over years previous, to a point where a lot of organisations communications and management strategies were utilising technology, but subsequentially when the pandemic struck, they were swiftly able to adapt to a full technology led approach to communications (Debata, 2020). Such technologies that had been significant for many years, as conference calling, virtual messaging, video calling, real time information sharing, communication hosting and many more, were quickly brought to the forefront of management techniques and allowed for mitigation of impact from the pandemic.

From all the technologies available to the industry, it is often hard for organisations to identify the most effective for opportunity in the vast market (Skibniewski and Chao, 1992). Figure 2.3 shows the top construction technology and innovation trends in the Construction industry in 2022. Whilst this highlights a list of advancing and new technologies being implemented in the general construction industry, the specific technologies being utilised within the retail sector differ from the general trends due to the constraints found within the projects and organisations (Seidu et al., 2021).

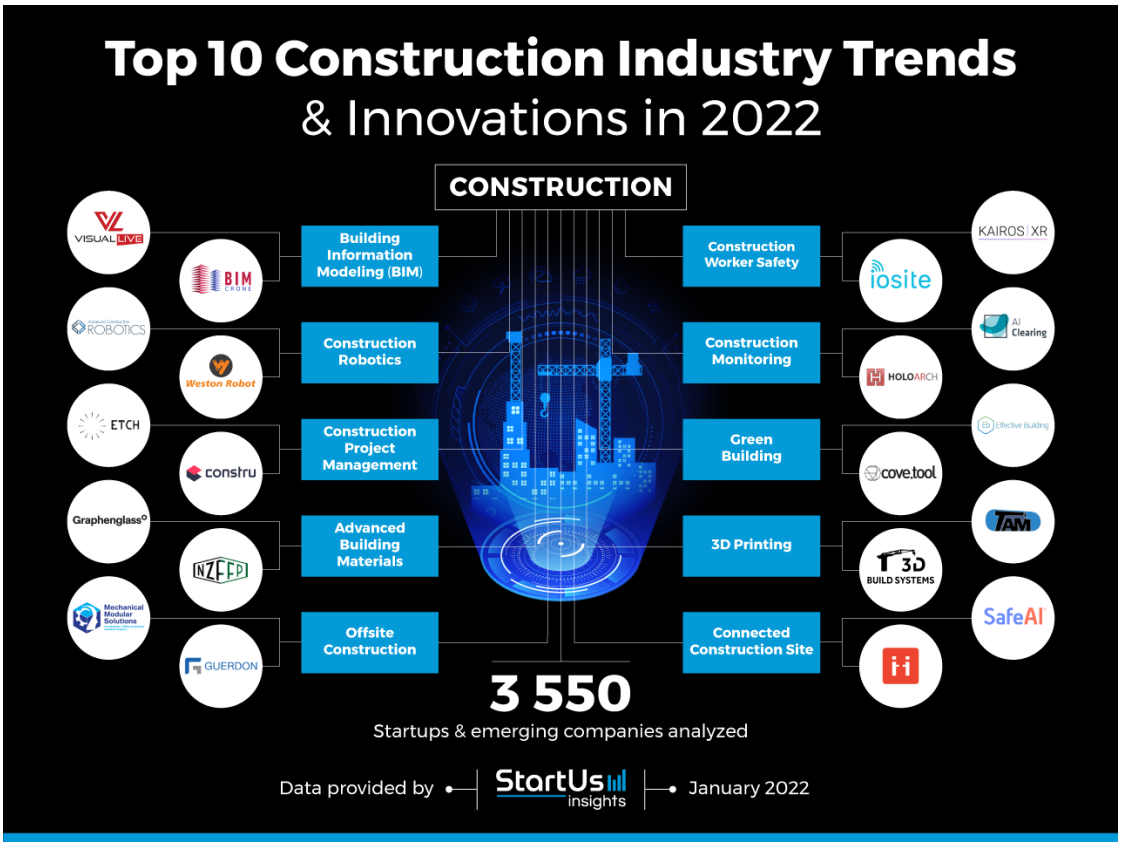


Figure 2.3; Top 10 Construction Industry Trends (StartUs Insights, 2022)

The key technologies discussed in this thesis have been gathered from multiple sources as identified as technologies which improve productivity in construction projects and organisations. Below, Table 2.1 identifies which technologies have been recognised within the literature review and a result of which have been chosen for the purpose of this thesis to be further considered and analysed against the thesis aims and objectives.

Table 2.1; Identified Key Technologies

Technology	Number of References	References	Review
Augmented Reality	7	CITB, 2018 CITB, 2019 Craig, 2020 Farmer, 2016 Heiskanen, 2016 Sharifi, 2018 Wang et al. 2013	Augmented reality adds digital information to the same known physical world, meaning it can be used by anyone with all levels of knowledge or understanding. It provides information in a way that any person can understand. (Craig, 2020)
Virtual Reality	7	CITB, 2018 CITB, 2019 Farmer, 2016 Heiskanen, 2016 Sharifi, 2018 Wang et al. 2013	Virtual reality presents information in a way that can be understood by anybody. It provides a virtual creation of information that can be understood by anybody that understands the real-world scenarios. Sharifi (2018) states that "*Virtual reality in construction is the next level in 3D modelling*."
Drones	2	Ciampa et al., 2019 CITB, 2018	Drones can be utilised throughout construction for a wide range of tasks that may otherwise pose an issue in the process. They can be fitted with intelligent devices such as cameras or sensors and can access areas that would otherwise be dangerous or inaccessible by individuals (Ciampa et al., 2019).
3D Printing	3	CITB, 2018 Construction Index, 2018 Perrot, 2019	Digital printing provides a solution to the way in which elements of build are designed. This can be in the production of new bespoke items or by utilising materials that would otherwise be unable to form such structures. The potential for 3D printing *"opens up new perspectives on the way in which buildings are designed"* (Perrot, 2019).
Off-Site Fabrication	6	CITB, 2018 CITB, 2019 Construction Index, 2018 Debata, 2020Farmer, 2016 Mossman and Sarhan, 2021	Off-site fabrication is a technology method that can see many benefits in construction projects. The inclusion of off-site fabrication can eliminant many inefficiencies within the construction process and has the potential to significantly increase productivity, sustainability, quality and time in construction projects (Mossman and Sarhan, 2021).
Artificial Intelligence	3	CITB, 2018 Debata, 2020 Pan and Zhang, 2021	AI is an area within construction that has many possibilities and potentials to improve construction processes. The automation of construction and design could see a significant development and benefits in construction process (Pan and Zhang, 2021).

Wearable Tech	3	CITB, 2018 Choi et al., 2017 Debata, 2020	The use of wearable technology can help to improve many elements of construction, from health and safety to communications. It could improve the way construction projects are built and could see less injuries in the process (Choi et al., 2017).
Lidar / Sensors	2	CITB, 2018 Wang et al., 2015	*The use of LIDAR and sensors is already being utilised in design and surveying but has potential to further improves construction projects. "LiDAR opens up new possibilities in the field of real-time construction defects detection and quality control far beyond the traditional predefined times."* (Wang et al., 2015).
Cloud Based Sharing (paperless)	6	CITB, 2018 CITB, 2019 Debata, 2020 Farmer, 2016 Hargrave (2017) Wong et al., 2014	Cloud information sharing is becoming a critical factor in construction design and build processes. Where requirements are seeing project teams spread internationally, cloud-based sharing is becoming a key requirement. *"cloud computing technology is regarded as a major transformational force that is causing unprecedented change across the communication and business disciplines."* (Wong et al., 2014).
Building Information Modelling	5	Armstrong, 2015 CITB, 2018 Farmer, 2016 Heiskanen, 2016 Mahamadu et al., 2019	BIM has been discussed for many years, with the full potential not being fully utilised through the entire industry. As technology develops the BIM potential also develops, with its potential to bring construction projects into a more technological based process through all stages of a project (Armstrong, 2015).

2.5.1. MIXED REALITY

The terms augmented, virtual and mixed reality includes a wide range of software and hardware for utilisation. For the purpose of this thesis the specific applications of augmented and virtual reality will be discussed and were considered together, will be discussed as 'mixed reality'. Mixed reality has been considered a key driver in utilising technology to improve productivity in construction projects, in design and on-site benefits (Heiskanen, 2016). These types of products aim to utilise both the realistic and conceptual visualisation to aid in efficiency and productivity during construction delivery stages. Construction project teams are often dispersed, with many ways to collaborate digitally over a distance, but often the time it takes for communications and the quality of information between site delivery and design teams is a contributor to the inefficiencies and low productivity of projects (Heiskanen, 2016). Augmented reality (AR) and virtual reality (VR) adds a different dimension to digital collaboration, making it much easier for team members to interact more effectively between different elements of a project team (Greengard, 2019). The implementation of augmented and virtual reality in construction projects has been growing, since its inception over 20 years ago (Park et all, 2013). However, mixed reality's main benefits and considerations are typically focused on the design stages of the projects and its interactions with clients to foresee the design aspirations and aid in visualisation of design at concept or planning stages of a project.

One of the key uses for this technology when considered against project delivery and improvement of productivity, is its proactive nature of visualising issues in real time that any

individual can easily identify during a construction fit out. Wang et all. (2013) discussed this, stating that "*Augmented Reality (AR) creates an environment where digital information is inserted in a predominantly real world view*". This method of visualisation of issues against the real world negates the requirement for site labour to be able to have experience, knowledge or training of specific issues or expertise and the information being transferred is on a simplistic format of visual identification (Fewings, 2012).

One of the biggest factors for the lack of implementation of mixed reality when considering it against the UK retail construction industry is the lack of understanding of the technology and its potential (Heiskanen, 2016). The lack of retail construction organisations' ability to adopt this technology successfully leads to a constricted knowledge pool around the technology and prevents companies from investing in applications such as mixed reality. Bouchlaghem and Thorpe (1996) carried out survey questionnaires across the field of construction companies within the UK and found that the main cause of companies' hesitation to apply such technology into its projects was the high prices of such applications and the lack of knowledge around its benefits. This was also considered against the training requirement for the applications to be implemented, which may be one of the barriers that the UK retail construction sector faces, when trying to adopt technologies like mixed reality in an attempt to increase productivity (Sharifi, 2018).

2.5.2. Automated Systems and Off-Site Fabrication

One of the key technologies that has the potential to change the construction industry and its' perceived issues with productivity, is the implementation of robotics or automated systems within the manufacture and delivery stages of construction (Altinisk, 2019). As has been seen across other manufacturing industries - such as car manufacturing or other controlled environment industries - the use of automation and robots has directly increased efficiency and productivity on projects and has also dramatically reduced waste (Construction Index, 2018; Pries and Janszen, 1995). Robots or machines will typically follow identical requirements, multiple times without tiring, slowing or reducing quality measures and will perform monotonous tasks without any drop in productivity, as a human may tend to do over time. (Verzhbovskiy and Reshetnikov, 2017) The use of robots or machines in delivery of projects could be a key implementation to resolve the issues that the construction industry face with productivity and waste (Altinisk, 2019).

Robotics can also work on tasks that may otherwise be constrained due to health and safety reasons, they can work through otherwise detrimental climates and can work without break for prolonged time periods (Lee, Migliaccio, 2018). The benefits shown by utilising robotics and automated systems can theoretically provide substantial improvements in any project where the process can be controlled and effectively implemented (Pries and Janszen, 1995).

Although robotics and automated systems appear to be an answer which can solve many issues in construction, the practical realities of a construction projects limit the utilisation and extent of direct benefits. As Verzhbovskiy and Reshetnikov (2017) discussed in their research, the use of automation can only be achieved where the parameters suit the specific nature of the robots and allow for autonomous processes. Ding et al. (2014) discuss the development of automated systems in construction and highlight that the "*slow development of automation technology in construction has been due to the following reasons:*

> *a) automation technology is not suitable for large scale construction products.*
> *b) automation technology is not suitable for conventional design approach.*
> *c) compared with other industries, the amount of the final output is rather less, and type are quite fewer;*
> *d) the imitation on material selection.*
> *e) expensive automation equipment makes the automation technology unattractive.*
> *f) the introduction of automation technology make an impact to the traditional management*."

One of the most common uses for robotics and automation in construction is the off-site fabrication processes, such as DFMA (design for manufacture and assembly). Within retail construction, there are many instances where off-site fabrication could be used to improve productivity and site delivery (Hage, Golonka and Putanowicz, 2016; Wu, Wang, Wang. 2016). However, due to techniques in design and planning for projects, as well as fast paced project timescales within these sectors, the introduction and utilisation of off-site fabrication has not been able to impact the sectors with such effectiveness as it has seen in other sectors, such as residential or industrial construction projects. One element that restricts the utilisation of off-site fabrication is within the design stages of a project and its lack of attention to the individual project constraints.

Many architects working on retail projects look to impose their aesthetic vision on a project, but rarely consider the full range of delivery techniques at early enough stages within the project's life. Mann (2018) discusses the perceived resistance of including off-site fabrication in design and mentions that "*architects will default to designing for an in-situ build at planning stage, and the project then has to be redesigned so that offsite components can be used*." Mann continues to discuss the needs to introduce more off-site fabricated elements into projects at the earlier stages of a project (RIBA stages 1 to 3) if there is to be an increase in productivity on site. He highlights that one way in which this may be achieved is through client objectives changing to suit the growing technology. This discussion of a client led technological adoption is something that has been discussed previously (Tibaut et al. 2016) and may prove to be a key aspect in achieving a more successful rate of adoption and implementation of technology in the UK retail construction sector, where project constraints are typically driven by highly driven client demands.

2.5.3. Paperless Technologies and Cloud Based Information Sharing -

As technology has progressed in modern society, the requirement to print physical copies of documents and share information on hard copies such as paper is becoming less relied upon and with environmental considerations, even becoming frowned upon. Within the wider society, preferences now focus on documents being sent virtually rather than printed or posted, with receipts issued virtually and much more information stored and managed online using cloud-based software, rather than physical storage (Pierri and Timmer, 2020).

The Covid-9 pandemic is believed to have driven this move to a more digital way of living in society, with the key factors being safety, but this trend has left a lasting legacy of online bookings, digital payments, minimal contact transactions and digital meetings being the preference rather than being alternative approaches (Robinson and Johnson, 2021; Pierri and Timmer, 2020). These advances have not transpired as swiftly into the construction industry, where projects and methodology of communications still remains predominantly hard copy of physically based with nearly all projects still residing to paper and pen during the project delivery (Farmer, 2016).

Where this move towards a paperless project can be beneficial, it is with the adoption and utilisation of technology that has the most benefit to the overall success in a more adaptive and efficient way. Hargrave (2017) discussed the use of an information management system on a fit-out project and how its impact resulted in increased productivity. Hargrave stated that "*by reducing the amount of time our people spent on unproductive activities, such as walking back to the project office to retrieve documents, [we] could see immediate gains in both productivity and efficiencies."* This use of a digital based communication system could also see issues being resolved in a much swifter time due to the speed in which information could be sent and reviewed and the efficiencies in communication between project stakeholders. This could result in a significant reduction of non-productive time on a project, where operatives and managers wait for responses or solutions which can take hours or days to arrive and communications can result in further queries or lack of clarity (Wong et al., 2014).

The utilisation of cloud-based performance software has in recent years paved the way for construction design to benefit from enhanced technology power in design and visualisation. Such software as AutoCAD Revit, now simplistically integrates the cloud-based storage facilities, both giving the users more storage, but also allowing for more intricate and demanding products to be developed without the necessity for expensive or dedicated hardware and providing more advances and benefits in communication and information sharing (Wong et al., 2014). The benefits of having cloud-based information sharing on a construction project relates to how the implementation can provide the management team with a multi-discipline platform to share information and increase efficiencies in communication by utilising a more collaborative approach with faster responses.

It has been highlighted that some of the inefficiencies found on every construction project are the time allocated to information sharing, especially when considered against the communications between contractor and client team, which on many projects can become a contractual dependency to record and issue communications in a formal, but ineffective time-consuming way (Whang et al., 2019). This can be explained when considering the simple task of a contractor requesting information or querying a design requirement. Often the task of receiving a simple answer can become convoluted in an exchange of documentation and email correspondence due to the potential of cost related recourse for either party. One way in which cloud based and collaborative information sharing benefits this process is to open lines of communication and collaboration and simplify the process in a user-friendly approach, whilst also providing an effective platform for recording such correspondence, should it be required at a later date. The benefits of this technology implementation approach to communication far outweigh any drawbacks and have been seen to increase a projects productivity and efficiencies by allowing a faster communication between stakeholders. Research also suggests that the adoption of such paperless style methodologies for delivering projects have seen significant increase in a project's success rate (Asgard and Jorgensen, 2019; Coddington and Mccloskey, 2012; Kirchbach and Runde, 2012: Reason, 1997).

2.6. BARRIERS IN TECHNOLOGY ADOPTION

In theory, technology adoption is a key factor in growth and competitiveness and a vital contributor to business success, regardless of the industry or sector (Sepasgozar and Davis, 2018: Straub, 2009). The way in which a business or organisation can utilise advancing technologies is key for them to develop and evolve and give them an edge over competition (Brandon and Lu, 2010). In a perfect world, a business would utilise every new or advancing technology to resolve occurring issues, streamline efficiencies, or increase productivity to constantly improve themselves. However, this simplistic approach of identifying a problem or opportunity and implementing technology to achieve a goal is not always a straightforward and simple task for organisations and in many instances, businesses can find that there are key barriers preventing them from adopting such technologies (Ahrweiler, 2010). It is vital for business to identify these issues and barriers to understand how to overcome them and generate the most potential from technology adoption as possible (Venkatesh et al. 2003).

There are many barriers for technology adoption in organisations, these can vary from knowledge, behaviour, social opinion, external factors, time constraints, economic constraints and organisational internal abilities or restrictions, such as their absorptive capacity (Cohen and Levinthal, 1990). Within the UK retail construction sector, the constraints on both projects and organisations are more specific to that sector due to the constraints imposed from the attributes of the sector.

2.6.1. TIME CONSTRAINTS

The fast-paced nature of the projects and the low margin constraints, results in implemental barriers being imposed on technology adoption, as businesses cannot afford or are unwilling to risk the time or cost when constantly competing for new works (Seidu et al., 2021).

Projects within the retail sector are more generally fast paced and shorter durations than of the other sectors, resulting in more frequent change to working conditions and minimising workers willingness to try new things (The construction Index, 2018). As a comparison, large construction or house building sectors can see the same supply chain and contractors working on the same project locations for multiple years. This can allow for the influence of change - including potentially technology adoption - to take affect and be implemented through the projects and organisations more successfully, with a settled and familiar labour force understanding the requirements over time. However, the retail sector tends to see a much faster pace of project durations, resulting in quick change in supply chain and labour force from one project to another (Bakry et all., 2014). Each time the labour force or supply chain is changed, or projects parameters change, this can put blockers on the willingness for adoption of new technologies and methods, resulting in a far more complex and difficult process of adoption for retail construction organisations (Novotny, 2019). The short duration of projects also limits the implementation and review processes of the technology adoption, resulting in more support being required to accommodate the technology adoption process in shorter time periods (Hardie and Newell, 2011).

2.6.2. CULTURAL APPROACH

The retail sector of the UK construction industry also sees a very traditionalistic approach to management and methods of construction, with senior managers typically being older in age and imploring a ‘tried and tested’ method of decision making (Bakry et all., 2014). This method of management and business strategy typically lends itself to an organisational behaviour that imposes barriers within itself due to an approach that if something has not been tested and successful in the past, it is unlikely to be succeed now. This lack of dynamic capability again imposes barriers in the technology adoption rates of an organisation, as without the ability to see potential success in innovation, a business is unlikely to successfully adopt and implement new technology and can result in falling behind the curve (Teece, 2009).

Within the sector, there is a culture approach to change and technology adoption that seems to be lingering behind the rest of the industry in its traditionalistic approach to change (Farmer, 2016). A common misconception through the construction industry is the idea that if something worked well on one project, it must benefit all projects alike. Throughout the construction industry, the sectors of build can vary from one project to another as much as construction can differ from other industries (Seidu et al., 2021). A technique or technology used to resolve a challenge on one project may be vastly different from the required solution on another project. The heterogeneous nature of projects then further increases when looking at the UK retail sector, which can see challenges and constraints differ from project to project, even on the same client framework. Cultural opinion of change, or even specific technologies, can play a large part of whether a technology is accepted and successfully adopted or not within an organisation (Lee et al., 2003). The discussion and unchecked promotion of unrealistic benefits can then impact the overall technology adoption rates of an organisation or sector.

The unsuccessful utilisation of technologies can also often compromise technologies reputation and can create cultural barriers for adoption when implementation is attempted (Park and Park, 2020). A cultural change is potentially required for the sector to see significant benefit from technology and the growth of successful technology adoption through organisations and projects within the sector (Lee et al., 2003). It has been discussed that this variance and uncertainty of perceived effectiveness to provide solutions can contribute to the cultural behaviours seen in the retail sector that often cause barriers in technology adoption (Arayici et al., 2011; Peansupap and Walker, 2005).

Parente and Prescott (1994) discuss the need for businesses to overcome their technology adoption barriers by identifying the key issues faced and looking to change the approach and behaviours to the business strategy for adoption. Within UK retail construction, there is necessity for a behavioural to change to allow and promote technology through the sector (Chibelushi, 2018). This can be seen in recent years to be driven by both the clients within the industry and the government, (CIOB, 2018; Farmer, 2016; HM Government, 2022) with key intitiatives being implemented to promote technology adotpion and implimentation. With this drive for more technology impliemntation, businesses may be able to overcome some of the barriers faced within to see more succesfull technology adoption for their benefit.

2.6.3. HETEROGENEOUS PROJECT CONSTRAINTS

Wiper (2012) discussed the need for construction sectors to aim to further incorporate technologies from one sector to another, where parameters of sectors remains constant or similar. Wiper stated that "*The world continues to evolve in every discipline and technology seems to be the common thread that connects the myriad of innovation. As designers, engineers, developers and users of residential and commercial projects one should be constantly learning about new technology and looking for ways to cross pollinate these ideas no matter where they come from*". Wiper emphasises that more effort should be input into the transfer of technologies from one sector to another. However, this transfer cannot always be as simple as utilising a technology from one sector into another due to the heterogenous nature of construction and the project constraints being specific from project to project (The Construction Index, 2018). The variance and differences in different aspects of construction sectors proves that what may work well in one sector, such as off-site modular construction for residential builds - which can provide huge benefits to productivity and efficiency and implementing the lean construction principles to benefit the projects (Goh and Goh, 2019) - will prove more disadvantageous in a sector such as retail, where the vast majority of projects are refurbishments, which must be considered within the constraints of an existing building, requiring more bespoke nature products and solutions. Retail also has typically seen minimal time for design stages, which often require adaptation throughout the project lifecycle to overcome the issues faced during the construction stage. This variance over the industry and within the sectors relates in technological transfer from projects being unpredictable and unreliable to forecast.

2.7. MODELS FOR TECHNOLOGY ADOPTION

Whilst there is a range of research regarding the different approaches' businesses utilise to benefit from technology adoption, the field of research regarding the more specific adoption of technology within construction organisations, and the theory behind construction specific decision-making processes to adopt new technologies is very limited (Mitroploulos and Tatum, 1999; Sepasgozar et al., 2018). For this reason, this thesis will look to review existing theories in the wider technology adoption field as applied to businesses in general, or within other industries, to try to adapt such theories and utilise them in the specific construction retail and fit-out sectors scenario.

The term technology adoption is often aligned with innovation or research and development (R&D) of a company (Loosemore, 2014). Rogers (2003) defined innovation as "*an idea, practise, or object that is perceived as new by an individual or other unit of adoption. It matters little, so far as human behaviour is concerned, whether or not an idea is 'objectively' new as measured by the lapse of time since its first use or discovery. The perceived newness of the idea for the individual determines his or her reaction to it. If an idea seems new to the individual, it is an innovation*". A business' self-ability to seek out, analyse and implement new technology is a critical factor to be considered in technology adoption (Cohen and Levinthal, 1990). Whilst this thesis looks to analyse technology adoption theories, the models for which technology adoption is accepted into businesses - and therefore the understanding of how such

adoption occurs – is assumed to be transferred across the construction sectors and from other industries and so can be reviewed in this context, but specific constraints of UK retail construction must still be considered.

2.7.1. TECHNOLOGY ADOPTION THEORIES AND MODELS

Absorptive Capacity

To review the technology adoption within organisations, it is important to understand the fundamentals that define the how successfully a business can react to innovations and the phenomena that goes with it (Zahra and George, 2002).

Absorptive capacity is "*the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends*". The absorptive capacity of an organisation differs from that of its individual members, but at its core, the absorptive capacity relies on the firm's prior knowledge and background of innovation to allow it to effectively benefit from the new information or change to effectively adopt and implement it (Cohen and Levinthal, 1990; Lane and Lubatkin, 1998; Stock et al., 2001; Van Den Bosch et al., 1999).

The idea of absorptive capacity in business allows firms to understand their potential to receive new information and apply it to their operations for a commercial and competitive advantage over other firms. The concept produced by Cohen and Levinthal (1990) can aid in the way in which this research looks to understand the problem, that UK retail construction organisations and projects technology adoption is less acceptive then other sectors and industries and by understanding the absorptive capacity of retail construction organisations, potential solutions can be understood (Sepasgozar and Davis, 2018; Zahra and George, 2002).

Dynamic Capabilities

Organisations are typically always in competition within their niches, sectors and industries and must constantly evolve, adapt and grow to sustain competitive edge (Ford and Hakansson, 2013). One way in which a business can obtain a competitive edge is through the means of innovation or development. The dynamic capability of a business is its ability to understand the opportunity of assets or innovations and to utilise such opportunities to grow or maintain an advantage (Teece, 2009). One of the biggest issues businesses face, especially considering the UK retail construction sector, is the changing market parameters that organisations are part of and ensuring they are adaptable to grow in their environments to obtain a competitive edge. This is a significant factor in the UK retail construction sector where external variables can often change the dynamics of the sector and client demands (Elliott, 2018).

Whilst the dynamic capabilities concept has been discussed in relation to general business organisations (Cha et al., 2018; Cordes-Berszinn, 2013), the dynamic capabilities can also be applied to the organisational management of projects, as Cha et al. (2015) demonstrated when they reflect the dynamic capabilities in relation to information systems projects. Where issues are identified in the technology adoption of retail construction organisations, a review of a company's dynamic capability may provide understanding into why a firm is falling behind and identify where a firm may be lacking the capabilities to truly adopt and utilise innovations to maintain growth (Anderson and Kin, 1991; Helfat, 2007; Jackson et al., 2016; Roffe, 1999). This would provide an understanding of a company's ability to adopt new innovations to either integrate into the organisation or project to give a competitive edge over other firms.

2.7.2. EXISTING TECHNOLOGY ADOPTION THEORIES

The issues that UK retail construction faces in relation to technology adoption can be discussed to provide an understanding and recommendation to future contractors and researchers of how barriers in technology adoption could be overcome (Edgell and Moustafellos, 2015; Hardie and Newell, 2011; Slaughter, 1998). As such, the analysis of existing technology adoption theories

is critical to help to identify issues and provide solutions to organisations looking to adopt new technologies (Rogers, 1995). The review of multiple technology adoption theories has been undertaken as part of the literature review and from this a decision has been made to determine the most suitable existing technology theory for the UK retail construction sector and organisations within it.

Within the field of literature, there are many different models and theories that are often discussed when considering the adoption of technology for businesses (Ajzen, 1985; Ankrah et al., 2009; Oliveira and Martins, 2011; Rogers, 1995; Venkatesh et al. 2003). The theories in which this thesis has identified as relevant theories to the research aims and objectives are;

- The Theory of Diffusion of Innovations (*DoI*) (Rogers, 1995),
- The Technology Acceptance Model (*TAM*) (Davis, 1986),
- The Theory of Planned Behaviour (*TPB*) (Ajzen, 1985)
- The Unified Theory of Acceptance and Use of Technology (*UTAUT*) (Venkatesh et al. 2003)

As part of theoretical framework review, this thesis will look to disseminate each theory to establish its relevance in the context of UK retail construction technology adoption and provide justification for the chosen theory to be used as a lens to carry out the data analysis.

Theory of Diffusion of Innovations

The diffusion of innovations is a social science theory that was first published by Rogers (1962) in his book; Diffusion of Innovations. In the 2003 edition (the fifth edition) Rogers developed the theory as a way to explain how a new idea would diffuse through an organisation to either be widely adopted or rejected. Rogers (2003, p05) defines diffusion as "*the process by which an innovation is communicated through certain channels over time among members of a social system*". This definition of diffusion outlines the key elements of Rogers theory, being;

- Innovation (*any idea, practise or object that can perceived by an individual as new*),
- Adopters (*individual or organisations looking to adopt the innovation*),
- Communication Channels (*channels that allow transfer of information between individuals or within organisations*),
- Time (*diffusion rarely happens instantaneously*) *and*
- Social System (*combination of the external and internal influences*)

In Rogers (2003) theory, he discusses the stages of adoption and the importance of different hierarchical individuals having varying levels of risk and social influence. He describes that the implementation of an innovation is not the final determining factor of full diffusion into an organisation. Rogers theorised that there are five stages of adoption within an organisation as shown below in Figure 2.4.

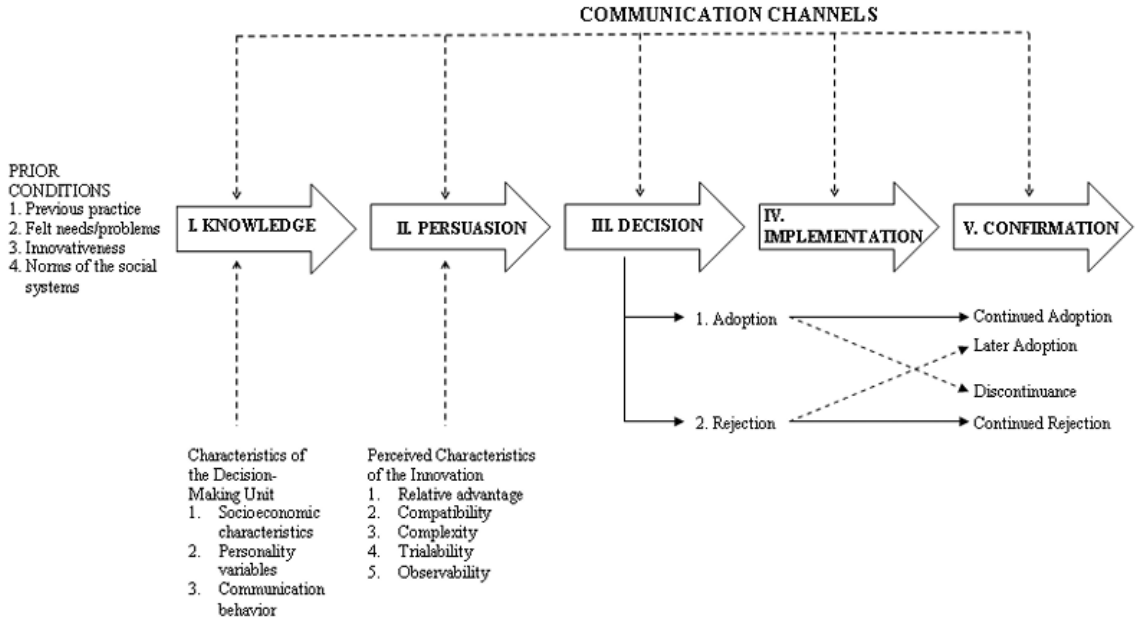


Figure 2.4; Diffusion of Innovations Model (Rogers, 2003)

The Diffusion of Innovations has been widely renowned as a sound technology adoption model in research and can provide a suitable theoretic model for the understanding of technology adoption within an organisation (Ankrah et al., 2009; Arditi, 2010; Kale and Straub, 2009; Loosemoore, 2002; Oldenbug and Glanz, 2008; Samad et al., 2016).

However, it has also been discussed that the diffusion of innovation theory may be limited, in a company's ability to adopt complex technology where the knowledge and understanding of detail around the technology itself is required but may not be fully understood by the researcher (Lyytinen and Damsgaard, 2001). In recent years there has been significant research exploring diffusion of innovation in construction research. Table 2.2 shows the areas of construction research that have utilised the Diffusion of Innovations Model;

Table 2.2 Diffusion of Innovations in Construction Research

Construction Research Area	References
Construction Management Technology	Shibeika and Harty, 2015; Harkola, 1996; Toole, 1998; Toole, 1994; Koebel, 2008; Larsen, 2011; Larsen, 2015; Kale and Arditi, 2010
Construction Design Technology	Esmaeili and Hallowell, 2012
Construction Health and Safety Technology	Larsen, 2015; Esmaeili and Hallowell, 2012
Construction Commercial Technology	Toole, 1998

There is limited to no research literature currently on more specific requirements pertaining to the constraints and issues faced in the UK retail sectors, which is what this thesis focus directly on.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) has been considered by some as being the most influential and commonly used theory for describing an acceptance of new technology and

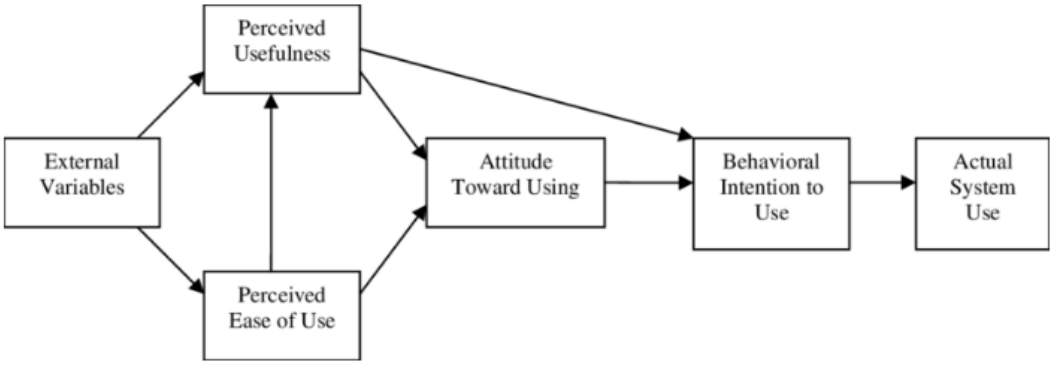
information systems (Lee et al., 2003). The TAM theory was originally developed by Davis (1986), but was later developed by Davis, Bogozzi et al. (1989) and progressed to the current model by Venkatesh and Davis (2000); who elaborated it for a much more complex use of the model. The model has been utilised and built upon for many individual circumstances through literature (Kale and Arditi, 2010; Larsen, 2015; Toole, 1998), but remains at its core the original concept by Davis (1986).

The principle of the Technology Acceptance Model is that, when individuals are presented with a new technology, there are predominantly five main factors that will influence their decision about how and when they will decide to adopt and implement technology, and these can influence the overall outcome of the adoption success. These factors are shown in figure 2.5 below, with the most influential factors of the technology being its 'Perceived Usefulness' and 'Perceived Ease of Use' as described below. The other factors then influence the individual's likelihood to accept the new technology;

- Perceived usefulness (PU) – how the individual sees the technology benefitting themselves or their job performance.

- Perceived Ease of Use (PEOU) – how much effort the individual sees they will have to input to implement the new technology

Figure 2.5;



Technology Acceptance Model (Davis et al., 1989)

In the later iterations of the technology acceptance model, Venkatesh and Davis (2000) discussed the external variables that may have impact on the acceptance of technology based on the individual. However, when reviewing this later iteration of the model against the research objectives and retail construction literature, it is believed that the simpler, earlier version of the TAM model is more relevant to the thesis aim, due to the limited research currently in the field of literature on technology adoption within the UK retail construction sector. Future research may look to develop the research by utilising the later iterations of the TAM model against the research findings.

Where the technology acceptance model (TAM) demonstrates value is by identifying the processes in the model along with external factors influencing the individual or organisation that are looking to accept the new technology (Park and Park, 2020). In their thesis 'Factors of the Technology Acceptance Model for Construction IT', Park and Park (2020) discuss that;

> "*if users consider IT in the construction industry easy to use, spontaneous attitude and behavioural intention are to be expected. Moreover, acceptance type, educational satisfaction, usage enjoyment, and usage experience are the factors that impact perceived usefulness, and educational satisfaction and usage enjoyment impact perceived ease of use as well*".

They proceed to discuss that in line with TAM the largest influence on technology acceptance in construction are the perceived usefulness and perceived ease of use, along with usage experience and usage enjoyment, which can be argued fall similarly under these factors.

The TAM model has been used previously in the wider construction technology adoption research fields (Park and Park, 2020; Younghwa et al., 2003) and looks to provide a model that allows the researcher to understand the influences on technology adoption through the lens of the individuals, key stakeholders, decision makers and end-users looking to utilise the technology. This also considers the external influences, the attitudes and social behavioural factors, all of which have been discussed and identified in literature as being key influences, when looking at technology adoption within UK construction.

Theory of Planned Behaviour (TPB)

The theory of planned behaviour was first introduced by Ajzen (1985) in his publication 'From Intentions to Action: a Theory of Planned Behaviour'. Since its first introduction, the theory of planned behaviour has been discussed as being one of the "*most frequently cited and influential models for the prediction of human social behaviour*" (Ajzen, 2011). The theory was proposed by Ajzen to improve the already established Theory of Reasoned Action which was established by Fishbein and Ajzen (1967). The theory focuses on the prediction of behavioural intentions of individuals and can be applied to various fields of research, such as; technology use, education, healthcare, consumer habits, social and psychological sciences. (Ajzen, 2011; Armitage and Conner, 2001; Krueger et al., 1993; Manstead and Parker, 1995). Whilst there is an abundance of literature and research utilising the theory of planned behaviour, from the literature review, there is a current gap in the field for construction specific research that utilises this theory.

The theory of planned behaviour suggests that human behaviour is influenced by three factors; 'behavioural beliefs', 'normative beliefs' and 'control beliefs'. The combination of these three factors leads to the behavioural intention, with the attitude towards the intention leading to the behaviour outcome (Aboelmaged, 2009). As part of the proposal of the theory, the below model diagram was formed to describe the process outlined in the theory of planned behaviour.

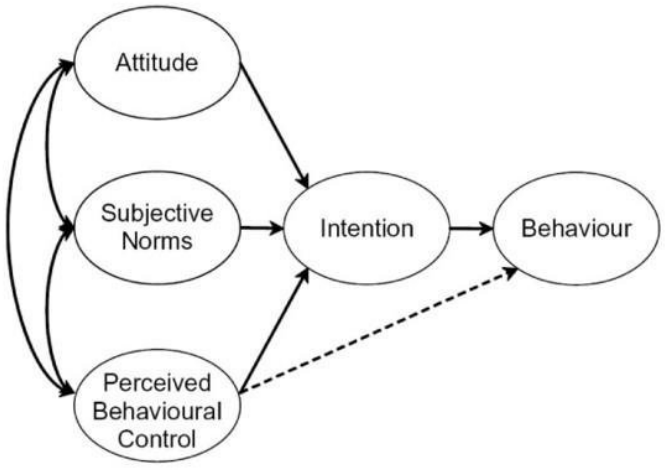


Figure 2.6; Theory of Planned Behaviour Model (Ajzen, 1991)

Ajzen (2011) discusses the limitations of the theory, being that at its core, the theory aims to predict decisions based on behavioural intentions. However, he notes that the theory may sometimes fall short where behaviour may depend on factors that are out of the individual's control. As such, one of the biggest criticisms of the TPB is the validity of the predictions using the model, especially in industries or fields of literature that have external constraints or influences such as the construction industry (Falko et al., 2014; Park and Manstead, 1995; Two and Loosemoore, 2010).

Whilst the Theory of Planned Behaviour acts as a suitable model to utilise individuals' behavioural patterns and predict behaviour intentions, the theory predominantly focuses on the decision-making predictions of individuals and the psychological, attitudinal and social

influences that may affect such decisions (Ndubisi, 2004). Where the research objectives of this thesis look to identify reasoning behind the technology adoption lull in retail construction and look to analyse whether the construction industry may require behavioural changes to allow the incremental technology adoption to be supported the TPB may be sufficient (Mak et al., 2019). However, the purpose of this research is to review the challenges and resolution on a more organisation level and the theory is limited with its analysis of the external factors, which are predominant within the UKM retail construction sector.

Unified Theory of Acceptance and Use of Technology (UTAUT)

Technology adoption theories have been widely discussed within the technology field and research on technology adoption has been stated as one of the "*most mature streams of information systems research*" (Venkatesh et al., 2007). In their paper 'User Acceptance of Information Technology: Toward a Unified View', Venkatesh et al. (2003) looked to review and combine eight of the most commonly used and prominent technology adoption theories in the field, to formulate a unified model for technology acceptance and adoption; The Unified Theory of Acceptance and Use of Technology' was developed. Figure 2.7 shows the diagrammatic explanation of the UTAUT model;

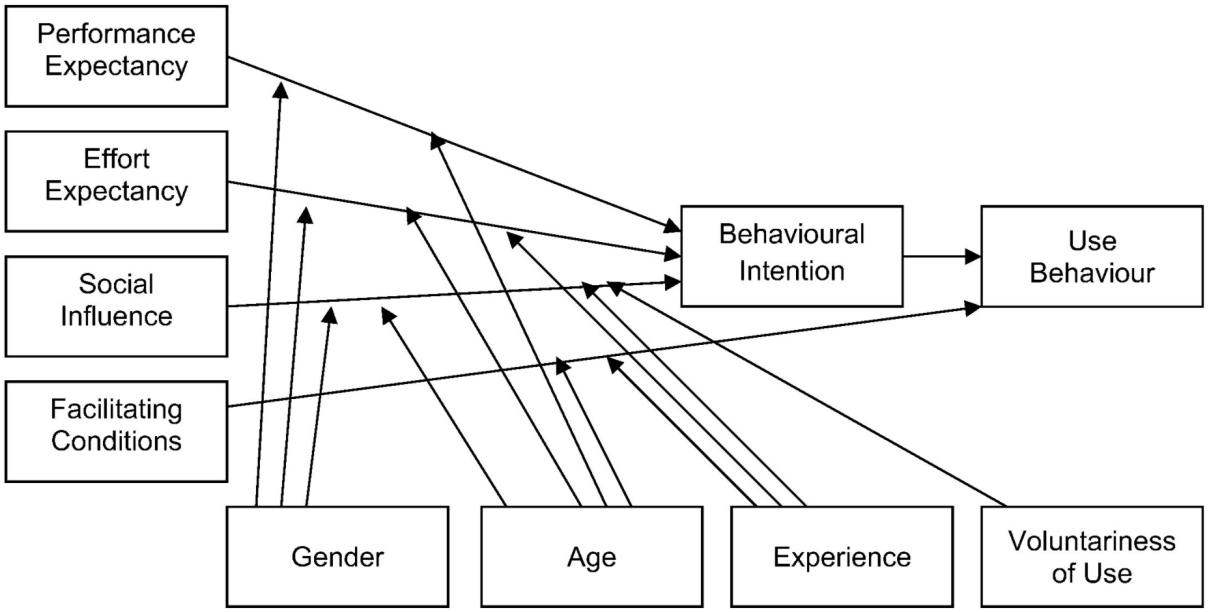


Figure 2.7; The Unified Theory of Acceptance and Use of Technology Model (Venkatesh et al., 2003)

Venkatesh et al. (2003) discussed that the use of many different technology adoption theories and models resulted in the situation that "*researchers are confronted with a choice among a multitude of models and find that they must 'pick and choose' constructs across the models or choose a 'favoured model' and largely ignore the contributions from alternative models*". They continue to discuss the shortfall in researchers using just a single technology adoption theory, rather than utilising the benefits of multiple theories, as their model proposes.

The Unified Theory of Acceptance and Use of Technology comprises four core constructs that determine the acceptance of a new technology; (Venkatesh et al., 2003)

- performance expectancy,
- effort expectancy,
- social influence

- facilitating conditions.

The theory then suggests that theses constructs are influenced by the user's gender, age, experience, and voluntariness of use. (Venkatesh et al., 2003; Williams et al., 2015) The UTAUT model suggests that when a researcher examines a phenomenon in the real-world setting, against these constructs and takes into consideration the potential users influences, that the researcher can look to determine the intention of adoption of certain technologies.

Whilst the UTAUT is a well-established and vastly cited theory for technology adoption and acceptance, the current research field does not wholly lend itself to this research objective within the construction industry. Whilst the UTAUT has been applied in many case studies throughout many industries (Williams et al., 2015), there is a limitation to research applying UTAUT to construction (Howard, 2017). Where this research looks to identify reasoning for shortfalls in technology adoption in retail construction organisations, the UTAUT focuses more on individuals and their specific behavioural intention, rather than a more organisational approach to considerations.

2.8. CRITICAL ANALYSIS OF THE LITERATURE REVIEW

From the review of the existing field of literature and with the focus on technology adoption in the construction industry, there is an identified gap in the current literature to discuss the more specific retail construction sector, which has its own challenges and constraints that warrant a separate discussion from the wider general construction industry (Bakry et all., 2014).

In the current field of literature for construction technology adoption, the following areas are identified as gaps or areas for future research progression;

- Technology Adoption within UK retail construction
- Construction productivity specific to the UK retail construction sectors
- Review of construction project and organisational constraints, specific to UK retail construction
- Utilisation of technology adoption theoretical frameworks, specific to UK retail construction

2.8.1. TECHNOLOGY ADOPTION THEORIES

The use of technology adoption frameworks is prevalent within the existing field of literature (Kale and Arditi, 2010; Larsen, 2015; Toole, 1998) There are many options for researchers to choose from as both theoretical and conceptual frameworks (Ajibade, 2018). Within this chapter, a number of relevant theoretical frameworks have been chosen for review and it has been concluded that the Technology Adoption Model (TAM) (Davis, 1989) will be used for the purpose of this research.

The rationale for the chosen framework, over the others identified is as follows;

SIMPLICITY

- The TAM model is a simplistic framework when compared to the other models discussed in this chapter, such as the UTAUT, which is much more complex (Williams et al., 2015). Whilst it can be discussed that its simplicity can be a negative factor (Park and Park, 2020) as it can limit the potential of the framework, with regards to the research objectives; looking to understand technology adoption specifically within the UK Retail Construction sector, the simplicity is a key benefit (Venkatesh and Davis,

2000). The lack of existing literature within the construction retail sector results in a limited pool of knowledge around technology adoption within this specific field (Howard, 2017). Therefore, to ensure the information can be easily disseminated within the confines of the research constraints, a more simple, yet effective model such as TAM is beneficial (Younghwa et al., 2003).

USE OF PREDICTION OF BEHAVIOUR

- The TAM framework has been widely discussed as an effective tool for identifying the prediction of patterns of behaviour from end-users and stakeholders (Park and Park, 2020). Whilst other models also provide this outcome, the TAM model can provide this with limited information based on its framework model inputs (Younghwa et al., 2003). It has been identified within the literature review that external factors are a significant consideration and influence on the outcome of technology adoption. Other models such as the Theory of Planned behaviour do not fully account for any external variables as effectively as the TAM framework, as so it has been decided that the TAM is most suitable (Krueger et al., 1993).

ADAPTABILITY

- The TAM framework is an adaptable concept that can suit the requirements of this research (Davis et al., 1989). The model has been effectively used with both quantitative and qualitative data (Park and Park, 2020). It considers the personal and social interactions of people, whilst also incorporating the external influences in a more quantitative approach if necessary. Whilst other frameworks can provide this level of adaptability, such as the Theory of Diffusion of Innovations, these can sometimes be criticised for being too specific and requiring a high level of information on the chosen technologies. The UTAUT, whilst being adaptable, also requires a lot of defined information, which is currently unknown in the UK Retail Construction sector unless an extensive data gathering was undertaken. The constraints on this research did not allow for such a significant task, so this was ruled out. Finally, the TPB does not fully consider the external variables within its model – to which the methodology and questionnaire design deduced would be a significant factor (Armitage and Conner, 2001).

Whilst other frameworks are available and could be chosen to be used for the purpose of this research, the limited research in the field of the UK Retail Construction sector resulted in limited information to base the model conclusions on, meaning that the chosen framework model would need to allow for the primary data and limited information from literature to draw conclusions and recommendations from. The TAM framework was chosen as it was simplistic, adaptable and could provide a sound model that aligned with the aim and objectives of this research.

2.8.2. TECHNOLOGY ADOPTION WITHIN UK RETAIL CONSTRUCTION

The existing literature in the field of technology adoption within construction continues to grow, with more technology becoming readily available and promising the answers for many construction problems (Park and Park, 2020). However, the way in which this technology is adopted and implemented into both construction projects and organisations can be fairly bespoke, with each technology looking to resolve a specific problem within the industry, leading to the research being fairly focused on certain aspects of the wider construction industry. This can lead to research sometimes missing out on other areas, such as the retail sector (Bakry et al., 2014). Throughout the wider construction industry, growth in technology has seen vast improvements over recent years, with technology growing exponentially with its range of implementations and user-friendly applications available to the industry (Hargrave, 2017), it is this research, specific to the retail sector that is currently missing from literature.

2.8.3. CONSTRUCTION PRODUCTIVITY SPECIFIC TO THE UK RETAIL CONSTRUCTION SECTORS

The issues identified when considering the lack of research data, when discussing the impact that the technology has on productivity levels, has also been more widely researched outside the construction industry, where technology used in manufacturing or office-based organisations has been reviewed against the productivity (Lehr and Lichtenber, 1998). Black and Lynch (2001) stated from their research on the impact of workplace practices and information technology on productivity, that "*investments in new technology are associated with significantly higher establishment productivity*." These findings show that in industries and areas other than construction, the investment of technology and its use can directly attribute to higher productivity, but there is little research on how this benefit in productivity can transfer directly to the UK retail construction sector.

The adoption of these advancing technologies has seen the construction industry start to change in recent years with many high value projects adopting innovative or advanced technologies with the aim to benefit both the project and the wider progression of the industry (CITB, 2018). When considered against the productivity benchmarks set by other industrial advances and Government benchmarks and targets, construction is still considered to see shortfall in its progression and integration of technology, especially when discussing the low productivity output of construction (CIOB, 2018; Farmer, 2016; HM Government, 2022). This may be due to the lack of utilisation seen in smaller scale projects or sectors such as retail, where the implementation of technology is not so readily accessible, the constraints are more imposing and the behaviour is more traditionalistic and opposed to change and where further research is needed (Bakry et al., 2014).

2.8.4. Constraints Specific to UK Retail Construction

The review of existing theories and literature in the field of technology adoption surmises that there are many theories to consider against the research aims and objectives, but a clear gap when considering the retail construction sector specifically (Davis, 1986; Dodgson, Gann et al., 2008; Loosemore, 2014; Nonaka and Peltokorpi, 2006). There have been few theories that pertain specifically to the construction industry and fewer that can specifically take into account the constraints and influences that have been identified in the UK retail construction sector. The external factors are key contributions that needs to be considered when looking at the research aims, with the specific retail constraints being a key factor in the technology adoption review in retail construction (Bakry et al., 2014; The Construction Index, 2018). It is also highly discussed that the client drive for change or technology implementation is to be considered, along with that of the individuals own experience and behaviours of the technology adoption process (Wiper, 2012). These factors are crucial influences and constraints that should be considered when reviewing the data gathered against a technology adoption model.

In cases where discussed, the research also pertains predominantly to large scale construction projects, where the implementation of technology could be considered easier to integrate both practically and commercially into a project of larger size and scale (CIOB, 2018; Farmer, 2016; Pike, 2015). Where the current research market lacks detailed discussions is specifically considering the challenges and barriers faced which prevent UK retail construction from successfully adopting technology to increase its productivity (Crawford & Vogl, 2006).

2.8.5. Utilisation of technology adoption theoretical frameworks, specific to UK retail construction

Sepasgozar et al. (2016) looked to develop the Technology Adoption Model (TAM) for construction, having focused primarily on the vendor influence on technology adoption. This broad model, whilst applicable to large construction, still fails to fully consider the constraints that the retail sectors impose specifically with regards to the building constraints and fast-paced projects. There is an identified gap in the research, specifically pertaining to the UK retail sector (Crawford & Vogl, 2006).

There are many differing opinions to which technology adoption model best suits the construction industry (Ayinla and Adamu, 2018; Sepasgozar et al., 2016; Singh and Holmstrom, 2015). Whilst each of the theories has its attributes, the nature of retail construction - being organisational in its initial adoption process but having specific constraints at a project level that vary from project to project (Pike, 2005) – means that there is almost a second requirement for technology adoption at a project level once it has been adopted at an organisational level. The heterogeneous nature of the retail sectors means that each technology adoption decision and process can be individual in relation to a specific project problem and whilst the decision to adopt such technologies can be made at an organisational level, the utilisation and implementation of technologies and therefore the eventual use of the technology can come down to individual and sometimes very specific needs and requirements. The success rate can then be determined by both the individuals experience, but also some external determining factors, such as client requirements, social review and availability for change (Pries and Janszen, 1995).

2.8.6. DEVELOPMENT OF THE RESEARCH QUESTION

As a response to the literature findings and the identified gaps within the literature review, there is a requirement for the development of the research question, which poses to resolve the identified gap within literature.

To resolve the gap in literature specific to the Retail Construction sector, the research question must be posed at this specific sector of the industry to ensure the research addresses this gap. Whilst the issue of productivity is an identified gap in the field of literature, this by way of existing literature is a known success factor and result of technology adoption (Farmer, 2016) and therefore, it is believed that this element of research is not a requirement within the main research question.

The specific constraints of existing literature and theoretical models must also be considered in the research question. The constraints of the sector, being the specific barriers within the UK Construction Retail sector is a key consideration to the research questions and should be included. The theoretical or conceptual model must also be considered within the question to ensure that the research focus and structure is defined within the question and focuses the answers and outcomes.

As a result of the development of the research questions from the identified gaps in the existing literature, the research question for this thesis was developed;

What are the key barriers preventing UK Retail Construction organisations from successfully adopting new technologies to provide solutions to increasing productivity, and can analyse if the theoretical framework; TAM, be utilised by organisations to overcome these barriers and increase technology adoption, to combat low productivity levels?

3.0 METHODOLOGY

3.1. INTRODUCTION TO METHODOLOGY

This section of the thesis will define the methodology of the primary data collection. The methodology of research can determine the outcomes of findings and how the information gathered can be reviewed against the research aims and objectives. The chosen methodology and the questions asked are typically influenced by the aims of the paper and usually depend also on the discipline are that the research falls under to ensure the methodology is suitable and most effective to the thesis. (Grove et al. 201) This thesis looks to utilise the mixed methodology approach, having a more quantitative approach in the survey questionnaire as the initial data gathering. The survey will determine the consensus from a sample of the widespread population within the retail UK construction sector. This information will then be disseminated to aid in the conclusions for the research but will also be utilised to develop the next stage of the methodology; open interviews with key personnel within the sector. This next stage will provide the qualitative approach to derive separate conclusions, with the intention to analyse and compare the findings from the two data collections and determine correlations to influence the final conclusions.

The methodology of this thesis looks to address the research aim by analysing technology adoption with UK Retail Construction and identifying from data gathering, key barriers and potential solutions to increase technology adoption rates. The questions of the survey and the interviews will be targeted through the lens of the TAM conceptual framework to review the technology adoption in UK retail construction in practise, to analyse any known barriers and potential solutions. The methodology will also be developed to ensure the research objectives are achieved. IT will do this by investigating the productivity issues within the UK Retail Construction sector and how technology can overcome any identified issues, it will look to identify specific technologies that are being used within the sector by organisations – to combat low productivity, it will aim to uncover key known barriers for technology adoption and finally by utilising the TAM framework, it will focus on identifying any recommendations in practise to overcome the recognised barriers. The data gathering will also target the use of existing technologies to review the impact of technology on productivity, whilst also ensuring the questions are focused on the key elements of the TAM model, being perceived usefulness, perceived ease of use and external variables.

3.2. PHILOSOPHY IN METHODOLOGY

The methodology of research can determine the outcomes of findings and how the information gathered can be reviewed against the research aims and objectives. The chosen methodology are typically influenced by the aims of the research and usually depend on the discipline that the research falls under, to ensure the methodology is suitable and most effective to the thesis (Grove et al. 2010).

This thesis looks to utilise the mixed methodology approach, with an analysis in the lens of the Technology Acceptance Model. The research thesis uses a deductive approach throughout the research, initially identifying the research problem and following a conceptual framework, to then gather data to test the theory. The initial online survey questionnaire will act to determine the key consensus from a population within the UK retail construction sector. This information will then be disseminated to aid in the final discussion and conclusions for the research but will also be utilised to develop the next stage of the methodology; semi structured interviews, with experts within the sector. This next stage will provide the approach to derive discussion in the lens of the TAM model.

The way in which this thesis aims to draw conclusions from the data collection will be at first through a positivist approach, which will be further explained in more detail within this chapter. The methodology in this thesis aims to objectively analyse factual data gathered from real world

scenarios, that can be studied and critically reviewed to draw conclusions from the raw data, with human bias and interests being irrelevant to the findings. This approach - using the positivist paradigm - has typically been prominent in construction research papers for many years, with quantitative research methods historically being more favourable. This method lends itself to this thesis in the way that it can allow for the results to be impartial and avoidant of personal bias and commercial gain. Fellows and Lui (2015, P. 13) discussed how "*quantitative approaches provide 'snapshots' and so, are used to address questions such as what, how much, how many? Thus, the data, and results, are instantaneous or cross-sectional*". They also discuss that one of the key aspects to allow the quantitative research method to work effectively is to build upon the foundations of historical, theoretical research - such as that carried out using qualitative methods – to draw from the overall theories and themes. With the vast amount of data available and the scientific nature of construction research, it can be argued that positivist paradigms suit the industry research field.

With the use of a qualitative research, it falls within the interpretivist paradigm, which – as outlined above – is less used within the construction research field due to its influences from human perspective. However, when considering the choice of research methodology against the thesis, an element of personal perception and experience must be considered to understand how human interaction with technologies can influence results. Where other industries can almost eliminate the human interactions with new technology to make it as efficient as possible, construction – even in its most efficient form – is still heavily dependent on manual labour and personal interactions with technologies. This required interaction and dependency on human performance with technology is one of the determining factors of this thesis, being that the productivity of construction projects is something that the individuals answering questions could be directly affecting. One of the key objectives is to understand how the use of technology can increase productivity, but if this increase can only be proportional to the personal operations on site, then understanding this potential cap in benefits will be essential for the thesis conclusions. With this intention to understand the key opportunities from the operatives and management point of view therefore lends itself to ethnographic research design.

The research in this thesis are carried out in both exploratory and explanatory methods. Whilst the premise of the research and the methodology uses a more explanatory research approach, identifying the research question and testing it, the literature review also uses an exploratory research approach in identifying the key barriers and analysing existing literature to identify key issues and barriers to then be further utilised in the research methodology. This mix-method approach aligns with the research data gathering, using an explanatory mix-methods by using qualitative work after the quantitative, to provide explanations for the findings.

The philosophy of research is a key part of the research strategy, and the philosophical position of the researcher should have influence over the methodology and lenses in which the literature is analysed (Proctor, 1998). The understanding of the philosophical issues is important as it grounds the research and generates further questioning and thinking (Holden and Lynch, 2006. Crossan, 2003). Personal philosophies can influence our perspective on everyday matters without even realising.

This thesis will ensure that the ontology and epistemology of the research aim and objectives are considered throughout the research. This thesis will consider the ontology, being that the research is grounded in the reality of how technology adoption can impact productivity for construction projects, and also what real-world barriers are preventing successful technology adoption within UK Retail construction. (Esterby-Smith et al., 2012; Grix, 2004; Jacquette, 2002). The aim of this thesis is to provide practical solutions to the real-world issues, to try to help solve the research problem. Therefore, the ontology of the research is a key aspect to be considered throughout this thesis. The epistemology will be considered in this thesis when discussing the philosophical approach and during the literature review, looking predominantly at the theoretical frameworks considered; to determine the issues faced and how existing theories

can be applied to review the phenomenon and provide theory-based recommendations to the issues (Byrne, 2016; Esterby-Smith, Thorpe et al., 2012).

Within the philosophy of research, the paradigm is the lens in which a researcher will interpret the way they carry out their research, from the analysis of the literature review and methodologies that are undertaken. This thesis will be reviewed in the lens of the pragmatism paradigm as it is considered that this paradigm best suits the researcher and the research aims, which poses to route the research back to the problem to try to provide a real-world solution (Boulton and Fitzpatrick, 1994; Saunders, 2016; Schweber, 2016).

Other key paradigms have been considered, with positivism having a dominant use in construction management research (Crook and Rooke, 1997; Seymour, Crook et al. 2010; Syemour and Rooke,1995; Seymour, Loosemore et al., 1996). The primary principle of positivist approach is that the phenomena that occur within the social sciences can be identified as facts using data or evidence and that any relationships between these facts or identification can be established using scientific law (Al-Hamdan and Athony, 2010; Crossan, 2003; Schweber, 2016; Smith, 1998). Positivism typically utilises quantitative approaches and deduces that these hard facts and law can typically be transferred into quantitative data for critical analysis (Fellows and Liu, 1997; Russell and Keat,1975; Theunissen, 2014; Winch, 1958).

Alternatively, an interpretivism approach was considered for the research aim, concentrating on the social behaviour of reality and social reality as a construct and being subject to the individual, as the social realities are dependent on different individual perspectives (Bell et al., 2019). Interpretivism aims to analyse the interpretations from subjective point of views and understand how the different opinions can affect the outcomes of the research based on the personal behaviour (Pham, 2018; Schwartz-Shea and Yanow, 2012; Schweber, 2016; Vrasidas, 2001). As Saunders (2016, P.141) explains; the way in which pragmatism aims to conclude research findings is by "*considering all theories, concepts, ideas, hypothesis, research findings and empirical data gathered, not in an abstract form but in terms of the roles they play as instruments of thought and action, and in terms of their practical consequences in specific contexts*".

The use of pragmatism when combining methodologies is a common discussion in social science. (Creswell, 1998; Creswell et al., 2003; Creswell and Miller, 2000; Wilson, 2014) A pragmatists approach will look to identify a problem then use any relevant methods and tool to answer the question or find a practical solution to the issue. Pragmatists do not align themselves with one philosophical stance and instead recognize the importance of the social and natural world. They will focus primarily on the 'what and how' of the issue and questions of the research (Baert, 2005; Creswell, 2003; Scott, 2016). This reflective process of understanding the uncertainty through the pragmatic lens is one of the ways a researcher can understand the research problem and focus the research to find practical solutions to such problems and questions.

3.3. RESEARCH DESIGN

This thesis will use the mixed-method approach, utilising the review of survey data and combining it with the interview responses. The mixed-method approach will utilise the quantitative survey questionnaires and the qualitative interview questions as a basis for data gathering. Creswell (2015, p. 19) describes mixed methodology as;

> "*An approach to research in the social, behavioural and health sciences in which the investigator gathers both quantitative (closed-ended) and qualitative (open-ended) data, interrogates the two, and then draws interpretations based on the combined strengths of both sets of data*."

The mixed methodology approach will be utilised for this thesis through the review of data gathered from the survey and interview responses. The methodology will then analyse the findings to determine any correlations or contradictions between the sets of data gathered and the literature review findings. This analysis will provide outcomes against the research aims, but alone will not determine the final conclusion. Provisions will also be required to be in place to ensure the interviewers knowledge or findings from the quantitative research does not impede or influence any questioning or answers, to ensure reliability in the interview responses.

The way in which the mixed method design will be utilised is through the triangulation of both the survey and interview research to corroborate the findings of both methods of research. Amataratunga et all. (2002, p. 17-31) discuss the benefits when they state that;

> "*Triangulation is the combination of methodologies in the study of the same phenomenon. The assumption in triangulation is that the effectiveness of triangulation rests on the premise that the weaknesses in each single method will be compensated by the counter-balancing strengths of another*".

As discussed in their paper, Amaratunga et all, discuss how for certain circumstances and fields of research, the use of a single methodology can prove more effective, but where each methodology may fall short in a research topic, the combination of both closed survey and open interview data gathering to achieve the same goal can prove more effective and improve reliability in findings.

The research methodology of this thesis will look to establish methods for data gathering to provide suitable and reliable findings, for use in the discussions and conclusions. The interviewees will be with persons within the construction industry that have experience with technology adoption and can be considered experts in the field of retail construction, also having knowledge of construction productivity and how this can be affected by both internal and external factors. The sampling of the questionnaire and interviews will have to consider these factors, to gather a collective that is representative of the wider population. The design of the research will include observations of the interviewees within their experiences aiming to provide a reliable and well-rounded set of data. The aim of utilising the interview research method will be to fully understand the data gathered and allow for a semi-structured discussion to gather extensive information around the subject, from the interviewee's experiences and knowledge.

As outlined within the introduction chapter, this research will look to utilise the TAM framework as an underpinning to achieve the research aim and objectives. To form part of the methodology of the research, the TAM model can be discussed at its fundamentals; looking to understand and predict the behavioural intentions of individual end-users and stakeholders. As the TAM model looks to analyse only the factors that can influence behavioural impact, the use of the model will be undertaken as a conceptual model. As it has been identified within the literature review, some external variables within the process of the technology adoption, can have a direct impact on the successfulness, but not necessarily changing the individuals' behavioural characteristics. To determine the populations understanding of the factors influencing technology adoption within UK Retail Construction, a quantitative approach could be used. However, to fully understand the more phycological understandings and behavioural influences of factors preventing technology, as outlined in the TAM framework, a more qualitative approach would be suitable. To ensure validity of the findings against the research aim and objectives, a combined method is proposed.

To develop the quality of the methodology, the closed online questionnaire and the semi-open interview results will form the basis of a conclusion to the research aim. The integration of these two methodologies must be effectively utilised to determine sufficient results for analysis. The way in which this will be achieved is through the 'explanatory sequential design' of the mixed method approach. Creswell (2015, p. 23) describes the mixed methods design as "*an explanatory sequential design, in which the intent is to first use quantitative methods and then use qualitative methods to help explain the quantitative results in more depth*." By utilising the

mixed method approach, the analysis of the two methodologies can be integrated to greater determine the results and conclusions from this.

This merging of the two different methodology styles has received criticism in the past, such as Zou, Sunindifo and Dainty (2014) who discussed how scholars have previously stated that "*quantitative and qualitative methods are in separate paradigms, and so could be considered as incompatible*". The positivist and interpretivist paradigms have differing concepts, as positivism relies primarily on fact-based information or hard data and interpretivism takes into consideration human interest or social aspects. By combining the two paradigms within a mixed method approach, it can be argued that this research design can provide a more reliable and valid set of conclusions against the thesis aim (Creswell, 2015, p. 32).

Where the chosen methodology may risk the reliability of the thesis could be in the potential for contradiction between the two chosen methodologies. The closed survey approach may draw conclusions from widespread consensus, but the individual human-interest factor and potential for bias from the interviewees may cause contention between the two methodology findings. To ensure the validity of the data the results will need to be thoroughly analysed prior to comparison to ensure anomalies can be discounted and the conclusions are as reliable as practicable.

The benefits of carrying out a mixed method research approach is that the two forms of methodology can be utilised to enhance the findings and evaluation. Fetter et al. (2013) discussed how "*the qualitative data can be used to assess the validity of quantitative findings. Quantitative data can also be used to help generate the qualitative sample or explain findings from the qualitative data*". They further evaluate the benefit of combining the two methodologies to enhance the findings and develop a stronger conclusion. As discussed by Creswell (2015) the use of each individual methodology separately can include inherent weaknesses, such as; "*quantitative research does not adequately investigate personal stories and meanings or deeply probe the perspectives of individuals*." The way this affects the thesis's outcomes is the narrative that; to evaluate the technology adoption discussion, the respondents must understand the success factors and barriers from their own experience or knowledge (Bolderston, 2012). This understanding and experience, whilst can be determined by answering close questions, can also be further explored and give more informative findings if provided with an open platform for the respondents to provide discussion of opinion or experience-based answers. However, the use of the survey questionnaire then provides a platform to allow for a more consensus style approach to the answers, where the sample of respondents can reach much further than the interview approach (Gorrell et al., 2010). Combining the two approaches can provide a more well-rounded response for the final discussion (Creswell, 2015).

From the data that can be collected using the relevant methodologies, the analysis of the primary data will be required to be considered to form the basis of the discussions and conclusions. As the data will be presented in its raw format, prior to the discussion, the survey information shall be analysed using a descriptive statistical analysis, providing summary of characteristics of the data without any discussion around the findings. For the discussion chapter, the cluster analysis will then be utilised as the information will be taken from multiple data sources (literature review, quantitative data and qualitative data) and reviewed against characteristics of groups of patterns, based on the TAM theoretical framework. These characteristics will be determined from the TAM model, to allow the information to be discussed within the lens of the TAM theoretical framework. By analysing the data in this way, it will allow the research to be concluded against the aims and objectives of this thesis.

3.4. DATA COLLECTION METHODS

To allow for the thesis to devise outcomes and conclusions, the mixed method approach will be proceeded, with data collection from surveys and interviews. To continue with the mixed methodology, the survey data will be gathered in a more closed structure questionnaire

approach, whilst the interview questions will be more open-ended. Continuing from the methodology focus, the survey-based method will be utilised as a pilot study to be reviewed and aim to develop and focus the interview questions from results found.

The way in which the quantitative data collection will be gathered, is in the form of online questionnaire, using the online platform 'Survey Monkey'. The consideration must be taken to determine the validity of the online forum as this will feed into the qualitative methodology of the mixed methods approach in determining conclusions, and therefore any incorrect data can have an effect on the overall results of this thesis. Balch (2010) describes the requirement for consideration in the type of online surveys stating that "*failure to follow best practices in Internet survey design can result in faulty data collection and therefore lead to erroneous conclusions*." Balch discusses the advantages and disadvantages in using internet survey methods and the type of design required, relevant for the specific research criteria. As the intention for the online survey is to develop a close question survey that can provide analysis of the results, the online platform, providing a multiple-choice style questionnaire is deemed to be the most effective solution for this.

Where the survey questionnaire may prove to have issues is through the quality of the result and engagement of the candidates that participate in the questionnaire. The use of an online platform will aid in both the dissection of the individual responses, but also the validity of the overall results from the questionnaire. Baker, Crawford et al., (2004) discuss the uses of web-based questionnaires and its advantages when analysing responses in their paper. They discuss how;

> "*one of the major advantages of Web surveys is the easy availability of survey data as soon as they are collected. Analysis of these data can uncover major errors such as bad skips or out-of-range values or even minor design problems such as undesirable response patterns on individual questions. The nature of Web surveys makes it relatively easy to detect such problems and to correct them quickly*."

This quick and effective built-in review platform shall be utilised to aid in the development of the interview questions. Where the online platform 'Survey Monkey' will provide both raw data from the questionnaire and also a level of analysis and review of this data, it will form the basis of development into interview questions, benefitting from the mixed method approach discussed previously.

One of the main factors in both the development and the review of the data collection for both the methodologies is to remain impartial and unbiased. Gorrell et all. (2010) states that "*despite widespread use, the use of questionnaires is not without problems. In particular, this approach may be susceptible to "common method variance" (CMV) bias. This occurs when respondents' answers to a questionnaire do not purely reflect their (intrinsic) thoughts about the phenomenon being asked about, but are influenced by the way in which the questions are asked - by (extrinsic) features relating to the design or administration of the questionnaire*." They discuss that in order to ensure reliability in the results, careful consideration must be taken when developing the questionnaire and also when analysing the results. This proves important in the quantitative review, as without an impartial analysis, bias may be transferred into the interview forum and effect the results. As part of the critical review of the quantitative data the review on validity will also be carried out to determine that both the data and the review of this has not been influenced and in-turn the structure and development of the qualitative interview questions are accurate for the purpose of this thesis and its conclusions.

The initial approach for the quantitative methodology data gathering was to produce a survey questionnaire for managers in the construction industry to answer. This would be focused on people working in the retail sector only. To help identify where anomalies could occur, the initial part of the survey was aimed at identifying the participants qualifications, position within the industry and type of projects primarily worked on. This would give validity to the research data that was gathered, by initially determining the key criteria for the participants to ensure robust

and guided data collection. By first understanding the knowledge and understanding levels of the participants the validity of the information gathered can then be analysed as relevant. An example of a question that could be included would be; '*Do you currently work within UK Retail construction?* Or *Are you involved in the influence of adopting technologies in construction projects?'*

The survey questions will then be developed to identify the participants background of projects and whether the chosen technology has been utilised in projects that the participants have worked within. The subsequent questions will then be aimed at identifying whether the participant had understood any productivity level on the project and whether the use of such technology could have impacted this. Where the survey may give answers that could give misleading or inaccurate information is where the understanding of technology adoption or the lack of hard data to prove change can affect the results. It is here that the use of the interviews will then allow for more elaborated and detailed answers to help identify the rationale behind the survey data responses. It is in this section of the methodology where it is believed that relevant outcomes can be achieved, when combining the data from the survey results and the responses from the qualitative open interview.

The second part of the methodology will be to conduct qualitative semi-structure interviews with experts within the retail construction industry, who have experience in management and technology adoption. As part of the interview process, the interviewees will be provided with the predetermined interview prompt questions. These will be questions that will be asked within the interview such as; '*what are the specific key success factors and barriers that relate a UK retail construction company, when looking to adopt and implement a new or advanced technology*?' This will also include a declaration for the interview to be recorded and used as part of the research findings. The population of the interviews will be developed and determined from the outcome of the online survey results and findings. Ensuring the correct knowledge and experience of each of the interviewees is determined prior to the interview.

The qualitative methodology of the interview questions will then provide more detailed and personal set of data to be analysed in the final discussions and conclusions. The triangulation of the quantitative survey questions and the qualitative interview questions, through the lens of the TAM model will provide the basis for the final discussion as it will allow the research to review the data that has been gathered against the TAM model and the literature review findings to provide analysis against the research question, aim and objectives.

The below diagram shown in figure 3.1 illustrates the proposed mixed methodology processes and steps that are to be followed to obtain reach a mixed method analysis and conclusions.

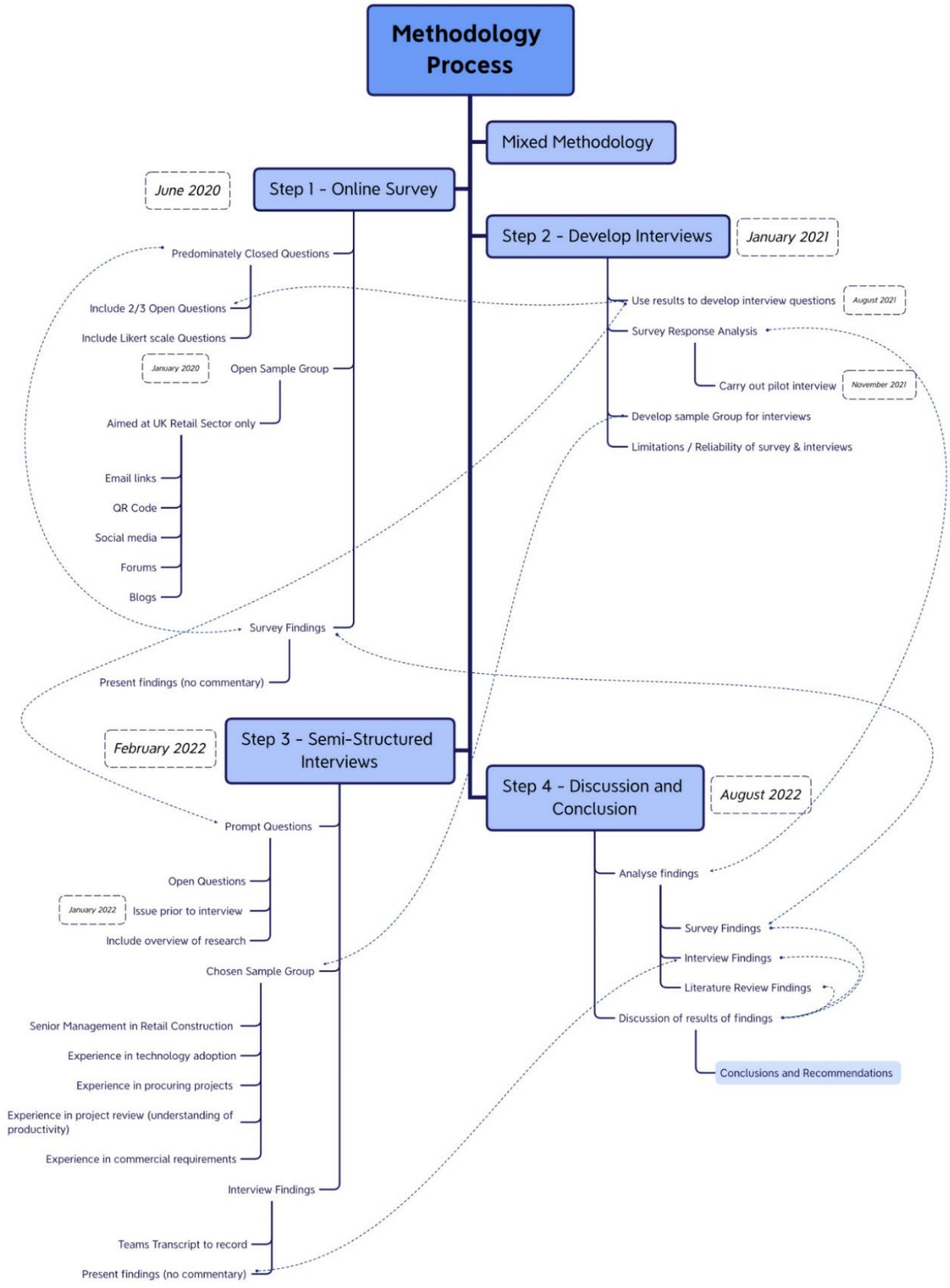


Figure 3.1; Research Methodology Process Diagram

3.5. SAMPLING AND POPULATION

The survey questionnaire will be utilised to benchmark the populations general views on certain aspects of the UK retail construction sectors, how technology adoption has been perceived and can affect and benefit projects within the retail sector. Where the survey acts as a more general and quantitative understanding of the populations views, this thesis will then focus on the detailed perceptions and understanding from a chosen sample of professionals within the retail sector. The purpose of the interview questions will be to act as a guide, allowing the interviewee to provide complete and detailed qualitative response based on their own experience, knowledge and opinion.

Based on the results of the survey, the questions requiring knowledge of specific technologies may result in anomalous results or lack of detailed answered (Jacob and Furgerson, 2012). The main focal point of the interviews will be to understand - from the interviewees perspective – why technologies are not implemented as effectively in retail sector as they potentially are in other sectors. As an example, such questions will be asked as; '*Do you believe there are any specific key factors that relate specifically to Retail UK Construction?'* It is also to establish any behavioural blockers and perceived constraints that would result in such technologies being less efficient and the reasons for lack of implementation. Finally, the responses from the interviews and surveys will also look to be reviewed through the lens of the TAM model, to understand if these fit within the theoretical framework.

Appendix B shows the interview prompt questions that were used in the interviews. The population was developed utilising the results of the survey and areas of information where the answers were deemed insufficient or potentially misleading from lack of knowledge. The population would be individuals who were in the category as identified in Table 3.1, below;

Table 3.1; Interview Population Requirements

Interview Population Requirements	Yes / No
Must work in Retail / Fit-out Sector of UK Construction	Yes
Must be at management level within a construction Company	Yes
Specific Age Category Requirement	No
Must have experience within retail construction industry (min 10 years)	Yes
Must have experience with technology adoption process	Yes
Must only have experience with specific technologies	No
Must have experience in project review (commercial / success)	Yes
Must have experience in project procurement / establishment	Yes

The individual interviewee's credentials and information were retained as anonymous for ethical and legal reasons as well as ensuring answers are as honest and reliable as possible (Bolderston, 2012). As part of the ethical development of the interview, the initial statement was produced, which can be found on the interview question sheet in appendix B. This was included to illustrate to the interviewees the purpose of the interview whilst also providing a statement of consent for the interviewee to establish consent to the answers being used and published within this thesis. The initial statement would be read to each of the interviewees as part of the beginning of the interview. Following this and the introductions, the interview would begin.

As part of this thesis, the population has been defined against the research aim and objectives. The thesis aim constrains the research population to the UK Retail Construction industry as that is a critical factor of consideration of the research. As outlined in Table 3.1, the specifics of the population requirements then must be factored into the chosen group. The experience of the

individuals must be considered, and they must have knowledge and experience both working within the UK Retail construction sector and an understanding of technology adoption.

This population defined by the parameters in Table 3.1 still leaves a significantly sized populations, which is geographically mixed throughout the UK and whose numbers would be extremely difficult to confirm. Due to the difficulty and complexity of trying to produce relevant sample groups across the entire populations, the sampling method for this thesis was chosen to be Convenience Sampling (Singh and Masuku, 2014). This method of sampling is considered the easiest as it is a method of sampling where the researcher choses a sample group that is most accessible to the researcher. This method of sampling, however, can cause limitation in results and may be argued that it is not representative of the entire population. Sepasgozar, Loosemore and Davis (20016, p167) discussed that "*investigations covering larger samples are scarce. This may be because large and rich data sets in construction are not available, and because they are very expensive, time-consuming and tedious to collect."* This understanding that construction statistics are not readily available contributes to the limited understanding of the researcher on the exact population.

According to the CITB (2022) the number of managers relevant to the sample group conditions in the UK Construction industry was approximately 184,500. CITB also noted that commercial projects attributes to approximately 18% of the overall output of the construction industry within the UK. Within this figure it is assumed that retail projects account for circa 50% of commercial projects. Using these figures as a benchmark to understand the desired population, it gives a known quantity of 16,605 relevant managers in UK retail construction. (Note; this is an unknown quantity, but for the purpose of understanding a *potential* population, this figure will be used) Using the standard sampling size equation $n = \frac{z^2 \times \mathrm{p}(1-\mathrm{p})}{e^2}$, where n is the sample size, z is the score of confidence, e is the margin of error and p is the standard of deviation (Pourhoseingholi et al., 2013; Singh and Masuku, 2014) From the sampling equation, the preferential sample size for the research survey is 71 (70.877) respondents.

With the above proposed number of respondents and the chosen sampling method being convenience sampling, the data gathering, as outlined in the data gathering designs section of this chapter is deemed sufficient. The researcher will issue the online survey via industry social links and via email and links to known businesses that manage retail construction projects nationwide. It is understood that this method of data gathering for the initial online survey is adequate to achieve the required number of responses and provide the necessary data collection for the initial survey questionnaire results.

For the interviews, the same population criteria was established based on the likelihood of saturation in the qualitative results. The saturation is identified as the point in which no new data is gathered from the collection method. As an example, the saturation point may therefore define that whilst 20 interviews could be undertaken, no new information was obtained after the first 4 interviews. As the interview process and data analysis of the qualitative information is a time consuming and laborious task, it is within the researcher's best interest to try to identify a potential saturation point, as not to consume too much time or commit to a task that may be greater than the time constraints allow.

As part of the initial interview process, the sample group size of 4-8 should be sought, to provide initial findings and understand the level of saturation (Hennik and Kaiser, 2022). For the purpose of this research thesis, the number of 6 interviews was chosen as this was believed to be the point at which the saturation could be identified and would become more prominent in the interview results. At the point of analyses, if the levels of saturation were seen to still be relatively low across all 6 interviews, then further interviews may be conducted.

3.6. SURVEY DESIGN

The thesis survey was carried out via the online survey portal 'Survey Monkey'. The survey was issued via an open survey link and QR code through email, Facebook and LinkedIn. The links to the survey were issued on 7th July 2020 and remained open until 31st August 2020, with prompts being issued midway to encourage responses.

The links and QR codes were distributed to known leading contractors within the UK Retail Construction industry and included a brief description of the thesis overview and summery of survey, stating the number of questions and expected duration for completion.

As identified from the Survey Monkey analysis of the survey, a total of 110 people responded to the survey. Of this the response rate for completion of the entire survey (with no skipped questions) was 66%, totalling in 73 full responses to the survey. The full survey response summary with all questions has been included in Appendix A.

The design of the survey questionnaire was developed to ensure the findings could be analysed against the TAM conceptual framework and allow for the development of the interview questions. The questions were derived initially utilising the themes of the TAM framework, being; Perceived Ease of Use, Perceived Usefulness, External Variables and Attitude towards Adoption. Where the questionnaire then devised alternative questions was to establish viability and understanding of the identified technologies from the literature review.

This structure can be seen in the questionnaire outline; The first section of the questionnaire derives the respondents' credentials and ensure that the respondents align with the chosen sample group criteria. The second section of the survey questions looks to understand the perception of technology adoption. This section, whilst not directly discussing the principles of the TAM framework, outline the respondent's perceived usefulness and requirements of technologies in line with the conceptual framework. Finally, the last section of the online survey discusses the key technologies that were identified within the literature review as being the most prominent or influential technologies in the current UK construction industry, therefore deriving the transfer of technology adoption from the wider industry into the specific retail construction sector.

By framing the survey questionnaire in this way, splitting the sections to ensure validity, utilisation of the conceptual framework TAM and specific understandings of the technologies utilised in the sector, the online survey looks to ensure the primary data collected is concise and effective. This data will then be used in developing the interview questions for the qualitative data collection and forming discussion and conclusion by way of triangulation of the findings, to ensure the overall research aim and objectives are met.

3.7. INTERVIEW DESIGN

In total, six interviews were held with chosen interviewees. The sample group were chosen from the criteria established in Table 3.1, being senior managers for UK retail construction organisations with experience in technology adoption in businesses.

All interviews were held via Teams online conferencing platform, with Transcripts being generated from the internal Teams software and exported to a word document for review and analysis. The raw transcripts have been appended to this thesis (Appendix D to H)

All interviewees were provided with the Interview prompt questions prior to the interview, which included a brief overview of the thesis and an acknowledgement and declaration for the interview to be recorded and used within this thesis. At the beginning of each interview the interviewer reiterated and confirmed the purpose and intention for the interview and again requested permission for the interview to be recorded via Teams Transcript and the contents of

the interview be used within the thesis. Table 3.2 shows the interviewee description and position along with the date and duration of the interview.

Table 3.2; Interview Sample Group

Interviewee	Position Held	Interview Date	Interview Duration
Interview A	Senior Commercial Manager	17th May 2022	33min, 14sec
Interview B	Head of Digital Construction	8th August 2022	30min, 20sec
Interview C	DFMA Senior Manager	11th August 2022	32min, 28sec
Interview D	Design Lead Manager	17th August 2022	40min, 51sec
Interview E	Operations Director	30th August 2022	47min, 21sec
Interview F	Digital Construction Director	7th September 2022	22min, 8sec

The design of the interview questions were developed from the review of the quantitative data gathered by the survey and produced from the literature review and TAM framework requirements. The interview questions can be found in Appendix B. The initial interview prompt questions were tested against a pilot survey and further developed to ensure reliability and functionality against the research aim and objectives.

3.7.1. PILOT INTERVIEW

As part of the data analysis and to aid in reliability, a pilot interview would be carried out ahead of the interviews to determine the quality of the interview techniques and prompt questions and make any necessary changes should they be required to benefit the overall reliability and outcome of the interview process. This has been determined due to the potential for misinterpretation in the semi-structured interview approach. Majid et al., (2017) discuss the requirement for piloting an interview-based research method and stated that "*piloting for interviews is crucial to test the questions and to gain some practice in interviewing*". They discuss in their paper, the benefits in piloting an interview and reflecting on its outcome to generate feedback on both the interview questions and design. They also talk about the need for interviewers to practise the interview process and develop skill sets, to which piloting the interview can be a crucial aid in this.

To evaluate the effectiveness of the interview prompt questions ahead of the remaining interviews, the pilot interview responses were reviewed against the strategy and requirement criteria for the interviews and the overall objectives of the research. Trull (1964) discusses the two main criteria of interviews being the 'Content' and 'Form'. Being that the content is "*what is actually being said and whether or not it is reliable*" and the form being "*how, when and why*" the information was given. Krouwell et al. (2019) go further into detail on the interview analysis and discuss the rate of speech and number of statement / codes when reviewing. As the final interview analysis will be carried out in the lens of the TAM, the number of different statements was less a critical criterion and the relevance of the statements was considered more viable. Also, when reviewing how the analysis would be undertaken it was decided that the rate of speech would not be a key review item, as the principle of overall duration and quality of responses would take precedence. Therefore, the analysis of the pilot interview has been developed to establish the four key criteria categories: Duration, Dominance, Quality of Answers, Ease of Discussion.

Interviews are a keyway of understanding a person's insights, experience and knowledge and extracting relevant information on a topic. Seidman (1964) states that "recounting narratives of experience has been the major way throughout recorded history that humans have made sense of their experience." He discusses the benefits of interviewing and how, different to quantitative approaches, it can allow people to tell stories, giving more information on a topic then may be obtained through other methods of data gathering.

The pilot survey is a crucial aspect in developing a full-scale research data gathering study (Teijlingen, 2013). The pilot survey allows the interviewer to establish whether the interview questions or prompts are well established to retrieve the relevant information they need when considering the research aims and objectives. It is also a good way for interviewers to practise their techniques and skills in interviewing prior to undertaking the full-scale interview process (Majid et al, 2017). It can also give a good insight into the level of detail required for solid data analysis and as such timings and question process can be altered to achieve the best outcome for the overall research findings.

As discussed previously, the key criteria established for the pilot survey was established for review and analysis of the effectiveness of the pilot survey. When reviewing the responses from the pilot survey against these criteria and as outlined in the above review, it was concluded that the pilot survey gathered sufficient and relevant data against the research aims. The information gathered was relevant to both the research aims and the chosen technology acceptance model and the provided a good insight into the experience and understanding of the interviewee. The timings and discussion of the interview were fairly free flowing with detailed information being provided, but without a constant requirement for the interview to be directed or steered. This provided a more open response rate, and whilst at times the interviewee discussed specific technology information, which was not pertinent to the aims, the overall discussion provided good responses relevant to the requirements. As such, the interview prompt questions will be carried forward to the full-scale interviewing process with minor adjustments to the prompt questions and the pilot interview responses will be taken into consideration in the final analysis of the data gathered.

The full analysis of the Pilot interview can be found in Appendix C.

3.8. METHODOLOGY ASSUMPTIONS, LIMITATIONS AND ETHICS

3.8.1. ASSUMPTIONS AND LIMITATIONS

It has been identified that assumptions have been made where information has not been present through the development of this thesis. One of the main assumptions of the thesis is the identification of the 'Retail Construction Sector'. To allow for recommendations and findings to be analysed within the context of this thesis, the generalisation of retail construction was needed to be made.

This generalisation of retail construction, being predominantly refurbishment works, within existing building constraints, with client limitations and focus on fast-paced tight budget projects, was implemented through the research development and analysis. Whilst the literature review and research findings both corroborated these generalisations (Bakery et al., 2014; Seidu et al., 2021; The Construction Index, 2018), it must also be acknowledged that the UK retail construction sector is not wholly limited to these type of projects, and can see more wide spread array of projects; some without such limitations as the generalisation identified. Where these projects fall within the retail sector, it can be argued that the generalisation is accepted as the technology adoption process occurs predominantly to organisations that would typically manage such constrained projects and therefore still require specific discussion on these.

The generalisation of organisations working within the sector also has limitations on the discussion, due to the nature of many contractors or organisations working on projects through

multiple sectors. Where this occurs, again the generalisation may be limited due to the organisations ability to process technology adoption through multiple sectors, having the same constraints on transfer of technology adoption as discussed throughout this thesis. However, it could be discussed that where this technology through an organisation occurs, it could be considered more successful to increase productivity in some sectors of the UK construction industry, rather than others. This difference in constraints over different sectors, but within the same organisation, is a research area that could be produced to further develop the research field, looking at how organisation transfer new technology through multiple sectors and whether specific barriers may occur in this process of transfer.

The limitations on this thesis findings and recommendations relate predominantly to the limitations of existing literature and the size of the sample groups and responses to the primary data. It has been discussed previously by Sepasgozar et al. (2016) that construction technology literature "*tends to focus on individual technology types rather than the overall technology adoption process*" and where technology adoption is discussed, it pertains only to the wider field and not the retail sector in particular (Seidu et al., 2021). This resulted in limitations in the literature review and where necessary assumptions and generalisations were made in the development of the discussion of findings against the literature. The main generalisation of this was to surmise that technology adoption within the UK retail sector follow the same general processes, barriers and success factors then the wider industry when discussed theoretically in literature. It was considering this that the discussed issues and factors relevant only to the retail sector were reviewed against the literature review to ensure the research pertained to the specific sector.

Further to the generalisations and assumptions made throughout the literature review and discussions, the sample group used for both the survey questionnaire and the interviews may be considered limited. The spread of the survey was pertained to the researcher's limitations in distribution. This primarily was known contacts or organisations within the retail sector who were within social contacts or online contacts of contacts. The sample group for the interviews was of a similar limitation as the interviewees were considered experts in the field of UK retail construction, but potentially limited in geographical regions. The range of distribution therefore could not be confirmed to be equally spread through the entirety of the country, through all regions. The researcher predominantly works within the London and surrounding regions; therefore it could be argued that the sample group and therefore findings could also be limited in regional results.

As part of the methodology of the data gathering, the interview process included a pilot survey to establish quality and reliability in the interview process. This pilot survey review can be found in Appendix C. It can be considered that a pilot survey could be considered for review against the survey questionnaire, similarly to the pilot interview (Majid et al., 2017). However, with the pilot survey being issued to a sample group that was predominantly known to the researcher, it can be established that the sample group and distribution for the survey negate the requirement for a pilot survey and analysis as the respondents were established management in the retail sector and the survey platform provided review on forecasted survey response analysis (Balch, 2010). This review limited the likelihood of misinterpretation of the survey questions, as they were posed as closed questions that should be simple to answer for professionals in the industry. The interview questions were considered more open to misinterpretation and chance for the interview structure to be disrupted, therefore the pilot interview was determined to be required. This is believed to be sufficient to provide a reliable methodology for data gathering.

3.8.2. IMPACT OF COVID-19

As discussed through the thesis, the research has been carried out from 2019 to 2022. The Covid-19 pandemic occurred during 2020 and significantly impacted the way in which the research was progressed.

Due to the Government Lockdown in 2020, the progress and planning of data gathering was suspended. The initial plan was to carry out the survey and interviews over the course of 2020 and 2021, but due to the lockdown restrictions, resulting in limited contact between people, the primary data gathering was delayed, and alterations were considered. With many people through the construction industry being affected, it was decided that the issue of the survey could be carried out as it was an online survey, but the interviews were to be delayed significantly until restrictions were lifted. As these restrictions continued in to 2021, the interview process was changed and the Microsoft Teams software was utilised, including the Transcript feature. This was then reflected in the methodology section.

The impact this had on the research methodology was to focus on the online survey and analysis to produce the interview questions. From this, the initial pilot interview was developed and carried out once the restrictions were lifted and the online interviews could take place. It was also considered that the response rate from the surveys was impacted by this, with many people in the industry being put on furlough through government schemes, or even just being impacted by the changes in day-to-day life (Debata, 2020).

3.8.3. RESEARCH ETHICS

As part of the research process, the methodology proposal, which included the draft interview prompt questions, the sample group and description of the data gathering proposal was submitted to The University of Westminster for Ethics consideration and approval. The ethics approval application was received from the university and can be found in Appendix J.

3.9. SUMMARY OF THE METHODOLOGY

The methodology chapter has outlined the key deliverable and methods for the research, to ensure the data gathered is relevant and effective towards the research goals and objectives. As outlined within this chapter, the philosophy of the methodology and the overall research has been discussed in consideration to the epistemology and ontology of the research. The paradigms that the research has been conducted in have also been identified to be through the lens of the Pragmatism paradigm as it has been identified that this best suits the nature of the researcher and the research objectives.

The research design has been produced using a mix-method approach. This methodology will combine that of a quantitative online closed question survey, and the qualitative open-ended interviews. The benefits of this approach, considered within the field of construction literature have been discussed. The TAM conceptual framework has been used to guide the methodology of the research. With the quantitative approach being undertaken to identify the consensus of a population on the technology adoption barriers and success factors, whilst then delving into the more fundamental and behavioural aspects, as outlined in the TAM framework, using the qualitative approach.

Finally, using triangulation the research findings can then be analysed through the lens of the TAM framework and model, to draw conclusions and recommendations from the findings. The cluster analysis approach will be used in analysing the data against the literature review findings, using the TAM framework as source for the themes of review. By utilising the existing model, the research will be able to draw correlations and conclusions and within the discussion and conclusion chapters of this thesis, the research will look to analyse the data gathered against the TAM framework to provide recommendations.

4.0 PRELIMINARY FINDINGS

4.1. INTRODUCTION TO PRELIMINARY FINDINGS

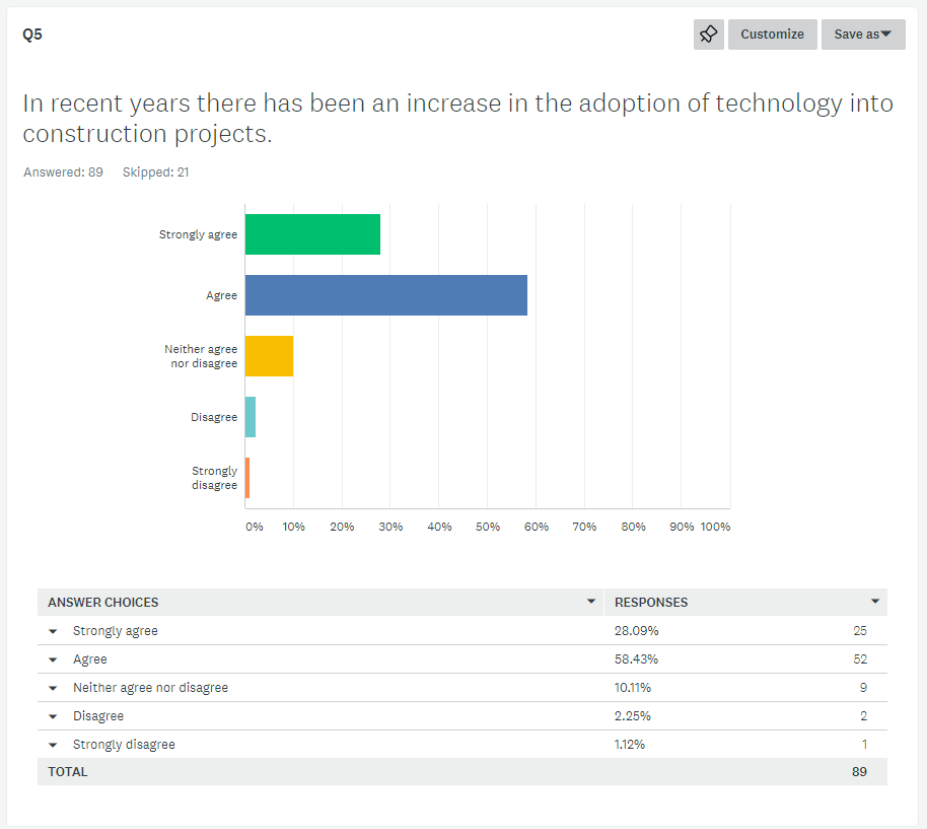
The survey questionnaire obtained predominantly quantitative responses, with clear empirical data being provided. Where the survey then looked to promote the development of the interview questions and quality of the interview findings, more open-ended qualitative responses were obtained. From these the data has been identified within this chapter as both quantitative in its review with word count style analysis to provide more data driven review. The purpose of this is to provide a more quantitative analysis style for the survey questionnaire, with the qualitative analysis being driven from the interview questions and responses, as defined in the methodology chapter of this thesis.

4.2. EXPERIENCE IN TECHNOLOGY ADOPTION IN UK RETAIL CONSTRUCTION

This chapter looks to provide the research findings from the survey questionnaire as presented by the Survey Monkey online platform and the Interview responses, derived from the interview transcripts. The findings are presented without commentary, with further discussion contained in the following chapters.

4.2.1. SURVEY RESPONSES

Within the survey results, 86.51% of all participants agreed that there has been an increase in the adoption of technology in construction projects. (58.42% Agree plus 28.09% Strongly Agree) Opposing this, only 3.37% of respondents disagreed with the statement (2.25% disagree plus 1.12% Strongly Disagree) and 10.11% neither agreed nor disagreed.



ANSWER CHOICES	RESPONSES	
Strongly agree	28.09%	25
Agree	58.43%	52
Neither agree nor disagree	10.11%	9
Disagree	2.25%	2
Strongly disagree	1.12%	1
TOTAL		89

Figure 4.1; Question 5 Responses

The Tenth question in the survey asks the responders whether they have directly seen the use of technology benefit the overall success of a project. From the results 36.14% of respondents

answering, ‘a moderate amount’ and only 14.45% answering one of the two extreme results of ‘a great deal’ or ‘none at all’. From this only 1 respondent answered none at all, potentially showing that from those that answered all, but a single person has seen benefit to a project success by utilising technology. Whilst the results show a consensus that technology has been seen to benefit the project success by the persons answering this survey, over 55% of respondents answered that a moderate or little amount of benefit was seen, with more people answering a little then a great deal.

4.2.2. INTERVIEW RESPONSES

As a development of the survey questions the first interview question was asked whether the interviewee had recent experience of technology adoption and what they believe may have been some positives and negatives from this experience. Out of all the interviews conducted, all interviewees answered ‘Yes’ to the first part of the question having had experience with technology adoption within the UK retail construction industry, with the second part relating to positive or negative experiences received different responses;

The prominent response for the second part of the question was that most interviewees had had a positive experience with technology adoptions. Interviewee B discussed their experience working on both contractor and consulting organisations; stating that they had “*been main contractor side for nearly eleven years and prior to that I was consulting. And adoption main contractor side, it Is a challenge*”. They then discussed some of the differences, discussing that “*the challenges are different. I would suggest, I think in terms of willingness to spend money on technology, I'd say that that's easier once your main contractor side*”.

Specific experiences or situations were stated by the interviewees, with negative experiences being reported. For example, Interviewee A stated that they had recently had a negative experience where they had attempted to present the adoption of a new technology, but it was rejected by the organisation without too much explanation or review. They also discussed that their experience of technology adoption and implementation in general has been neither predominantly positive nor negative as they felt that where they have managed technology implementation or adoption, they had found constant blockers, but equally they had been involved in technology implementation led or managed by others that felt to be positive experiences.

Interviewees C and F responded to the first questions stating that their experience, both being similar technology-based roles in UK construction organisations, was mostly a positive experience. Interviewee A discussed the difference in experience working for a consultant within UK construction to a Construction Organisation, and the challenges being harder to implement technology in a construction organisation as opposed to a consultant organisation.

The interviewees shared mostly positive experiences with technology adoption, with 6 out of the 7 interviewees sharing positive experiences. Interviewee B stated that they believed ”*there's lots of opportunity everywhere and there's, you know, desire to try and find opportunity to streamline things and improve approach, but we're inherently quite an old school kind of industry, and I think it's more of a generational thing. There's a lot of cultural approaches that tend to impede on success.*”

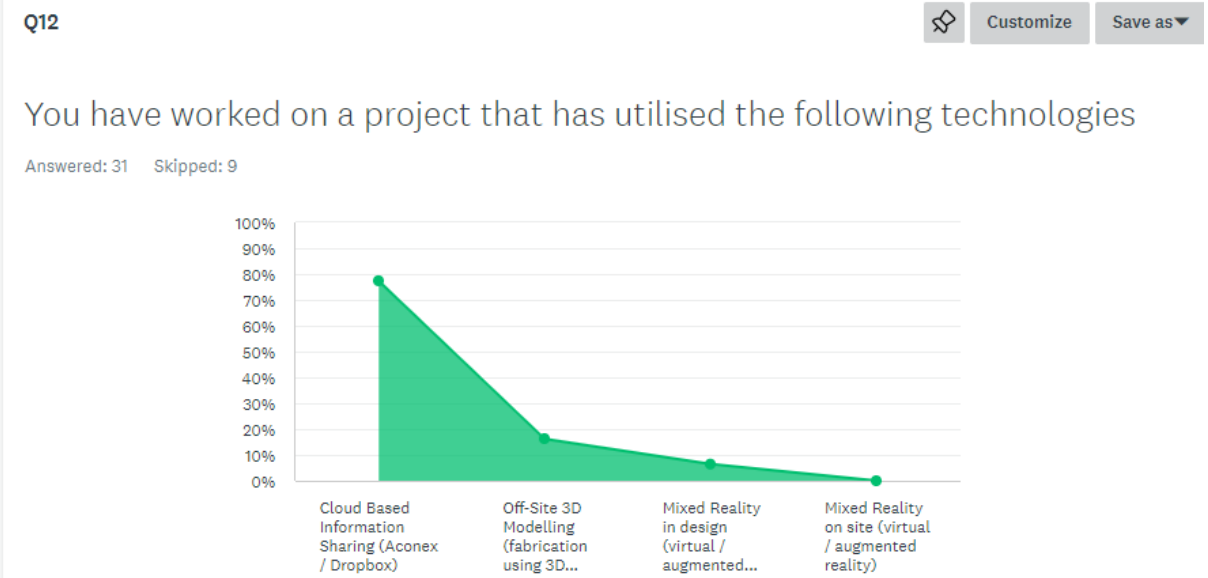
All interviewees stated that the outcome of the experience came down the how the technology adoption or implementation was managed or led and whether being adopted by the interviewee, or the interviewee being part of the end user engagement, the perception of usefulness and ease of use was a defining factor.

4.3. SPECIFIC TECHNOLOGIES UTILISED

4.3.1. SURVEY RESPONSES

As part of the survey data collection, the intention was to identify generic technology groups that are present in the retail construction sector. This was established from the literature review section and discussed previously in this thesis. From this the four main technology examples were presented to the respondents; Cloud based information sharing, off-site 3D modelling, mixed reality in design and mixed reality on site. The results from Question 12 of the survey showed the following statistics;

- 77.42% of respondents had experience using Cloud Based Information Sharing
- 16.13% of respondents had experience using Off-Site Fabrication
- 6.45% of respondents had experience using Mixed Reality (in design)
- 0% of respondents had experience using Mixed Reality (in on-site construction)



ANSWER CHOICES	RESPONSES	
Cloud Based Information Sharing (Aconex / Dropbox)	77.42%	24
Off-Site 3D Modelling (fabrication using 3D printing)	16.13%	5
Mixed Reality in design (virtual / augmented reality)	6.45%	2
Mixed Reality on site (virtual / augmented reality)	0.00%	0
TOTAL		31

Figure 4.2; Question 12 Responses

4.3.2. INTERVIEW RESPONSES

As part of the interview process, interviewees were asked about their own experience in technology adoption and as such were asked where relevant to give examples. This provided specific examples of technologies being used within the industry based on the interviewees experience and responses.

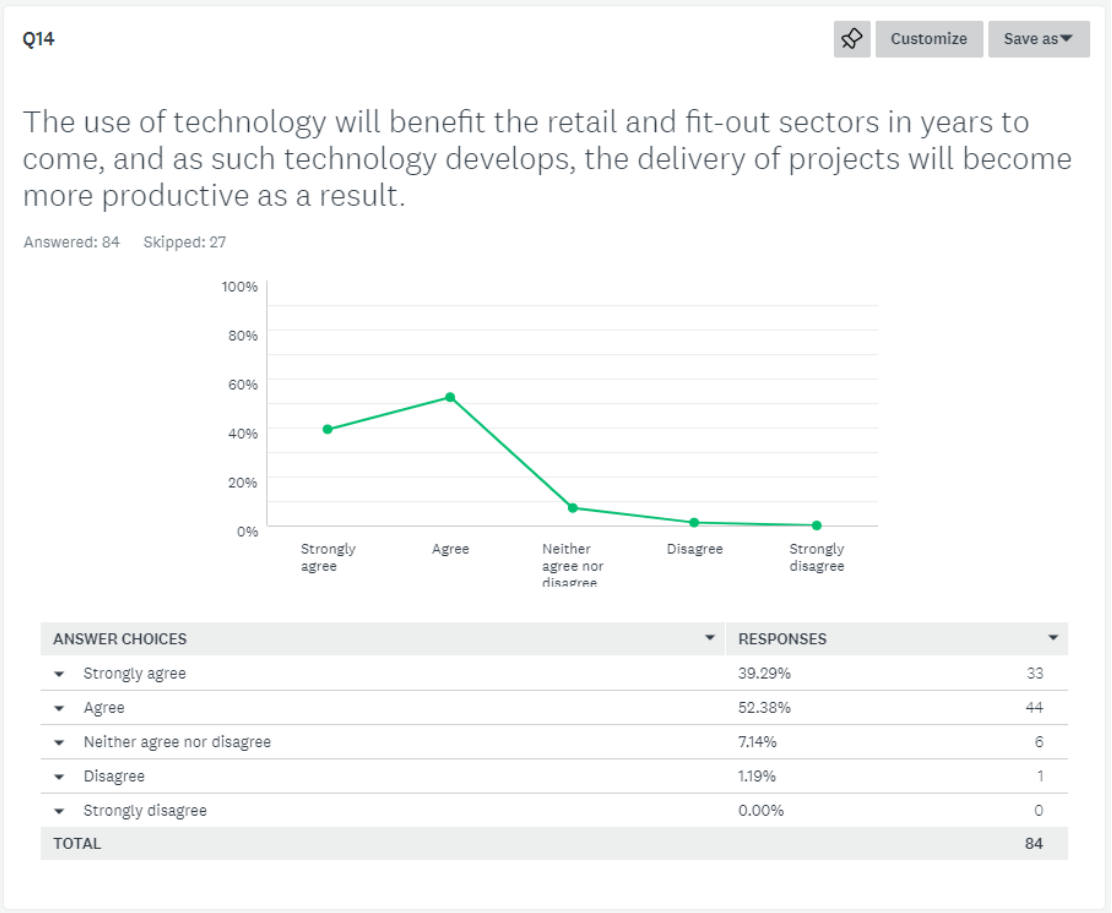
Table 4.1; Table of Discussed Technologies from Interviews

Interview	Technology Discussed	Interview Response
Interview A	Commercial Measuring Software CAD Clash Detection Software	Interviewee A discussed the use of a Commercial Measuring Software that would aim specifically at the commercial managers and quantity surveyors of construction organisations.
Interview B	BIM Cloud Information Sharing Clash Detection Software Off-Site Fabrication	Interviewee B discussed a number of current technologies that they believe are being implemented through the industry and sectors, being; 'Laser Scanning software' and '3D Design Clash Detection'.
Interview C	DFMA (Design for Manufacture and Assembly) BIM Cloud Information Sharing Mixed Reality	Interviewee C discussed DFMA (design for manufacture and assembly) as a key technological strategy that is being implemented throughout their current role in the UK retail construction sector. They also discussed as a subsequent technology of DFMA, off-site fabrication techniques.
Interview D	BIM Laser Scanning Clash Detection Software Cloud Information Sharing	Interviewee D, being a design lead for a large construction organisation discussed the changes in technology in the design process through their career, with such key technologies as AutoCAD and Revit being key drivers for design production and information sharing. They briefly discussed the BIM development, but also how the BIM features were not necessarily into full fruition within UK retail sectors, due to perceived usefulness throughout the sector, with both contractors and clients primarily opting for a more design presentation and less expensive focus of design output technologies such as Autodesk Revit.
Interview E	Cloud Information Sharing Reporting Software BIM	Interviewee E discussed the use of cloud information sharing and technology to promote business reporting and drive metrics. They also discussed the use of BIM integration.
Interview F	Cloud Information Sharing BIM Off-Site Fabrication	Interviewee F predominantly discussed the use of data management software and information sharing technology to aid in the management and reporting of projects and organisation information. Such information sharing platforms as Viewpoint were discussed as being key technologies in UK retail construction in the present climate.

4.4. KEY SUCCESS FACTORS

4.4.1. SURVEY RESPONSES

Question 14 of the survey was aimed at the respondent's perception of technology impact on project success and productivity. As can be seen from the results below, the large consensus was in agreement with the question's statement, with 39.29% strongly agreeing, 52.38% agreeing and only 8.33% either disagreeing or neither agreeing nor disagreeing. None of the respondents strongly disagreed with the statement.



ANSWER CHOICES	RESPONSES	
Strongly agree	39.29%	33
Agree	52.38%	44
Neither agree nor disagree	7.14%	6
Disagree	1.19%	1
Strongly disagree	0.00%	0
TOTAL		84

Figure 4.3; Question 14 Responses

4.4.2. INTERVIEW RESPONSES

In the interview questions, question 2 directly asked the interviewee what they believed the key success factors for technology adoption within businesses are. Question 3 then developed this and asked if the interviewee believes there are any specific key factors that relate specifically to Retail UK Construction.

From the responses in each of the interviews, a number of key success factors were provided as answers, with some of the factors being given by multiple interviewees. The results of each answer and number of times it was discussed is as below;

Table 4.2; Identification of Key Success Factors

Key Success Factor for Technology Adoption	Number of times factor was discussed (*out of 7 interviews*)	Interviewees that stated this factor
Initial Cost (investment)	6	A, B, D, E, F, G,
Usability	3	A, C, D,
Prior Understanding	5	A, D, E, F, G,
The Business Requirement	4	B, C, E, G,
Business Value / Benefit	3	B, D, G,
Time Constraints	2	C, F,
Client Input	3	D, E, F,

From the above table it is evident that the initial cost or investment was discussed in six out of the seven interviews. The second most talked about factor was then the prior understanding or knowledge and experience of the technology prior to the adoption process. The third most discussed factor was then the business requirement or need for the technology. This was

discussed as the ‘problem that needed to be solved’ by the potentially adopted technology. Interviewee D stated that a key factor is understanding the “*problem statement in the first place and establishing the need for technology*”.

The fourth most discussed factors were then the usability (or perceived usability), the value or benefit of the technology to the business and the client input or investment during the adoption of the technology. Finally, the least discussed factor which was also the only factor that was mentioned to be specific to UK retail sectors, was the time constraints of the technology adoption. The explanation in both cases was that the retail sector is so fast paced that the technology adoption process must match this pace, or it would be less successful.

4.5. BARRIERS TO TECHNOLOGY ADOPTION

4.5.1. SURVEY RESPONSES

Within the survey results, key words or phrases were extracted from the Seventh questions results, as shown below in figure 4.4. This gives an indication of some of the believed factors that contribute to why Retail sectors are less successful at technology adoption as other sectors. When reviewing the data, the following key words or phrases correlated across responses;

‘Resource’, ‘Clients’, ‘Experience’, ‘Value’, ‘Fast Track’, ‘Complex’, ‘Investing’,

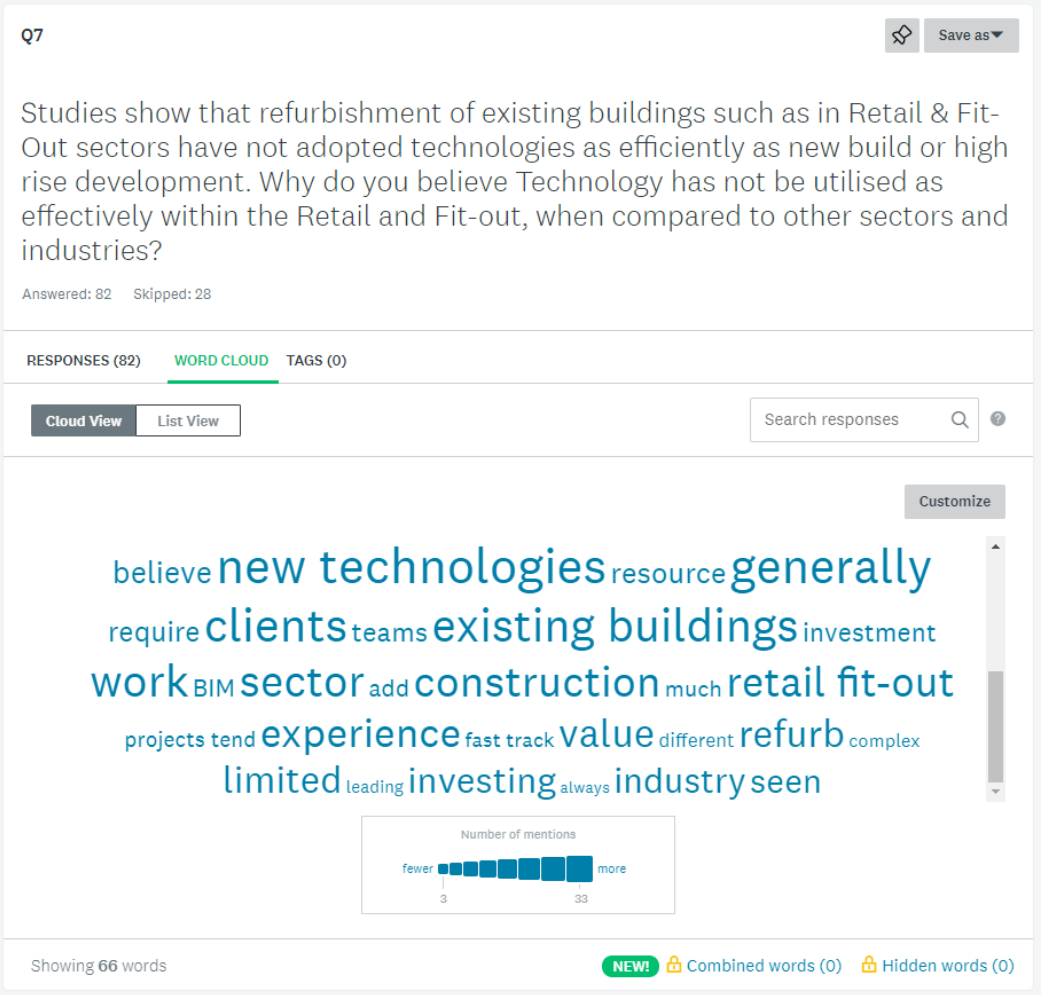


Figure 4.4; Questions 7 Responses, Word Cloud

Question 18 posed the question as to whether the individual would implement the technologies discussed in the future and asked the reason, if the answer was no.

81.71% of respondents answered that they would implement technologies into a new project.

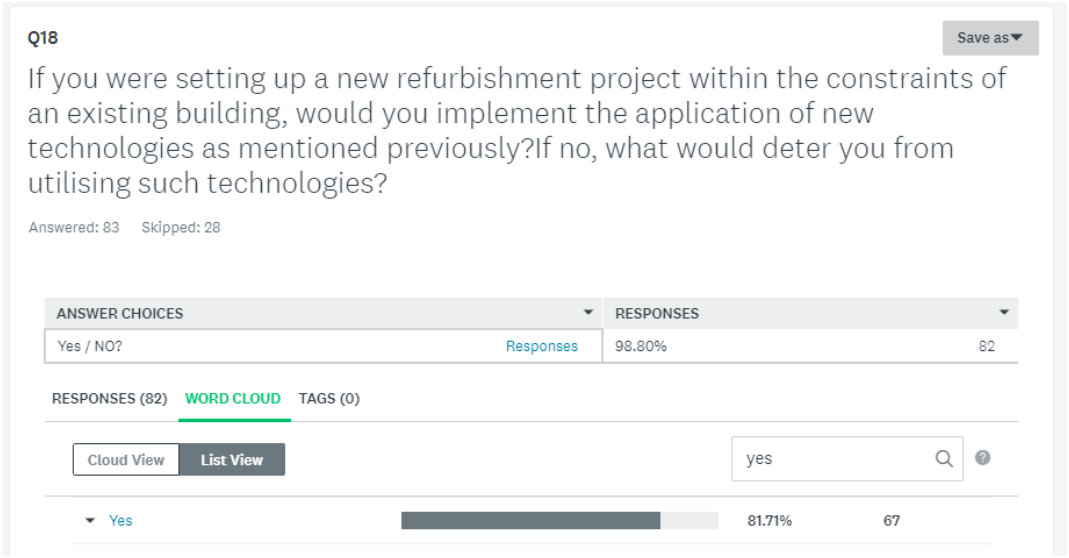


Figure 4.5; Question 18 Responses

Secondly, of those that responded 'no', the reasoning was reviewed as a word cloud, with the more common answers showing as larger words. As can be seen from below, 'Cost' was the most reoccurring statement with 10 responses, followed by 'experience', 'time' and 'client' being other reasons.

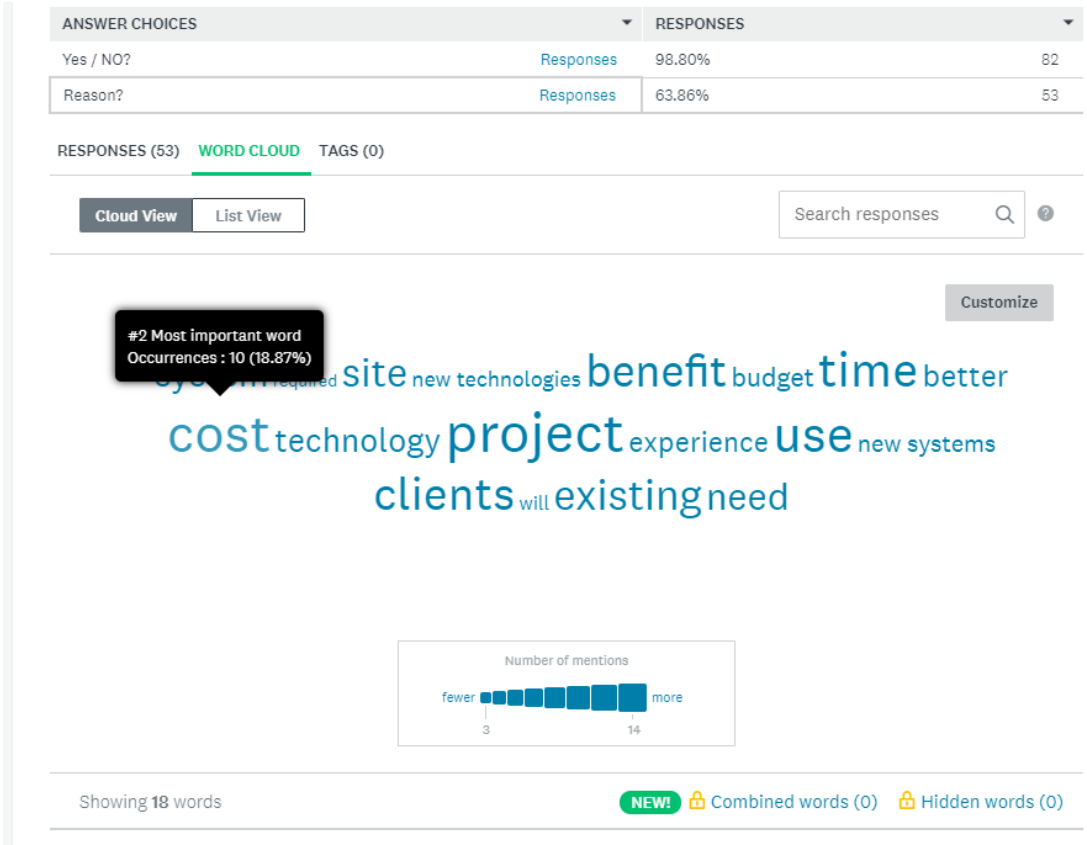


Figure 4.6; Question 18 Responses, Word Cloud

4.5.2. INTERVIEW RESPONSES

In general, all interviewees discussed the barriers faced when trying to implement technology adoption within the UK retail construction sector, with their experiences varying in specific issues they stated, but the predominant factors remaining fairly constant.

All interviewees mentioned that the 'fast-paced' nature of the UK retail construction sector resulting in a more difficult climate for effective technology adoption. With all interviewees also mentioning cost related barriers at some point in the interviews.

Interviewee B also discussed the existing building constraints being a barrier to technology adoption, stating, when discussing potential issues that "*especially in the retail sector, where you working in potentially a grade one listed building one minute or some 1970s building the next minute, to straight out of the ground in another context is the variable associated with what we do*." They proceeded to discuss the issues faced in Retail construction and how it has "*got some complexities that manufacturing doesn't have*", referring to the physical building constraints and changing environments.

Client demands were also mentioned by five of the seven interviewees. However, whilst most of the interviewees stated that the client demands dictated the success of technology adoption or implementation or drove the need for it, Interviewees B and C both discussed that construction organisations were keen to invest in the technology adoption to then provide a unique selling point for new clients and so the client demands were not necessarily a key driver or barrier of the technology adoption success. Interviewee E discussed the client impact and drivers influencing potential technology adoption for contractors in UK retail. When discussing the client influence on technology adoption in projects they stated; "*you know certainly from a client's perspective, you know, looking at certain technologies in the past it it does boil down to cost. Does the client wanna pay for it? What benefit are they gonna get out of it by paying 10s of thousands to implement something on a on a project*."
Interviewee E then mentioned that within recent years the trend of client management and decision making has changed and with retail construction clients typically now seeing a very quick turnover of management, this impacts the decision-making focus.

Where in previous years client decision making was much further long term, and the investment of technology adoption within longer term projects or thinking project lifecycle, in more recent years the decision focus is more short term and the demand for technology adoption that has a larger investment for a long-term benefit is less regularly accepted. Interviewee E states that client's used to "*plan for the long term*", They discuss that this trend has then influenced the technology adoption rates in general across the organisations as whilst organisations are happy to invest in technology, the client drive to also push for technology adoption accelerated this drive and increased technology adoption rates.

Interviewee E also highlighted the IT security constraints of an organisation being an initial barrier that is not regularly thought about in the inception of technology adoption but can often prevent the technology adoption process at its early stages. Being an operations director of a tier 1 contractor in the UK retail construction industry, interviewee E discussed their experience that many new technologies are presented and although may have excellent perception of usefulness and effectiveness to the business, the IT security constraints may swiftly block the technology adoption, stating that I their experience they have seen that "*you hit a brick wall with IT security*" during the technology adoption process. Where the technologies are newly developed, they may not be as secure as other alternatives which have had time to develop this side of the overall technology packages so can face barriers during the process.

4.6. SUMMARY OF PRELIMINARY FINDINGS

From the quantitative survey questionnaire, the raw data was collected using the online portal 'Survey Monkey' to be reviewed against the aim and objectives of the research. As outlined within the methodology chapter, the questionnaire has been designed in line with the TAM conceptual framework and with the intention of understanding the key barriers and success factors of the population. The preliminary findings chapter has reviewed the data from the online survey in an inductive and informative way, drawing no discussions from the information gathered, but instead commenting on the raw data analysis only.

The review of the preliminary findings has provided consensuses from the chosen population. Where the questionnaire was targeted at the sample group to understand the significance of the chosen specific technologies, identified within the literature review, the findings deduced that these technologies are not significant within the UK Retail Construction Sector. Further analysis of these findings will be discussed in the following chapters. The review of the data has been driven from the individual questions and where relevant comment has been made against the findings of the literature review or the TAM framework, only to further provide basis for the discussion of such themes or consensus within the discussion and conclusion chapters.

5.0 DISCUSSION

5.1. INTRODUCTION TO THE DISCUSSION

It has been discussed that the UK retail construction sector is a volatile environment for contractors and the implementation of technology within construction project can aid in the process and provide a solution to the issues in productivity. The data gathering of this research aimed to understand, from the population what the key barriers are that prevent the sector from successfully adopting technology to this effect.

As defined in the methodology chapter of this thesis, the data that has been collected from both the quantitative survey questionnaire and the qualitative interviews will be analysed within this chapter to form the basis of the discussions. Within this chapter, the findings from both data gatherings will be analysed using triangulation, against the literature review findings utilising cluster analysis techniques, to form correlations and analysis against the TAM theoretical framework. The cluster analysis method will be used with the clusters or themes being determined from the TAM model in section 5.3 of this chapter. The descriptive analysis of the preliminary findings will also be considered in this chapter when summarising the discussion.

From the data gathered, the analysis has been undertaken against the TAM model specifically for the UK Retail Construction sector. The analysis and results form the basis of discussion specific to this sector and its findings. The discussion of the technology adoption can be reviewed using the TAM model across the wider general construction industry. However, for the purpose of this research the sample groups of the data gathering, and the focus of the discussion are based specifically on the UK Retail Construction sector only.

5.2. EXPERIENCE IN TECHNOLOGY ADOPTION UK RETAIL CONSTRUCTION

It has been discussed within the field of literature that technology adoption within UK retail construction is deemed to be "*behind the curve*" of other sectors or industries, having a "*limited R&D and innovation*" progress (Farmer, 2016; Dulaimi, 2007).

From the data collection and review, the findings can be seen to contrast the view that there is minimal technology adoption as highlighted throughout the literature review section. In fact, 86.51% of all participants from the survey questionnaire agreed to having seen an increase in technology adoption within the UK Retail Construction industry. Of the remaining respondents, only 3.37% responded that they had not seen an increase or had no experience in this. This contradiction to the findings within the literature review can be seen as a recent shift in technology adoption within the industry, or as discussed previously, it can be an example of where technology adoption for businesses does not equally relate to subsequent, direct and immediate benefits, as can be seen in other industries such as manufacturing and plant production (Seidu et al., 2021).

When analysing the findings of the interview responses against this theme, the outcome provides a less clear distinction. Whilst all interviewees responded that they had seen or been directly involved in technology adoption and implementation in recent years, the feedback of whether the experience was positive or negative was varied. Whilst the general consensus correlated with the survey responses, reviewing the answers in further detail provided insight into the reasons why, the experiences could in some instances, be seen as negative, correlating more with the literature review findings (Dulaimi, 2007; Lai, 2017).

Interviewee A discussed the experience of being directly involved in a technology adoption process, which was unsuccessful. Giving the reason that the business were unwilling to invest in the potential of the new technology and stating that the decision to abort the technology adoption came "*from a point of view of people who are nervous of it, not convinced by it*". They

proceeded to discuss that the perception of the technology for the stakeholders who are approving the technology adoption at an early stage, was a key factor that could impact the success rate, before the process is even able to gain momentum.

In contradiction to this and supporting the response to the survey, Interviewees B and C discussed that their experience of technology adoption within the UK retail construction industry were primarily positive. Interviewee B discussed their experience between working for a consultancy in previous years and now working for a contractor, stating that working on the contractor side within UK retail construction there are *"more challenges"*. However, then following up to say that *"in terms of willingness to spend money on technology, I'd say that that's easier once your main contractor side".*

Whilst the data gathered may show that there is more of a drive for technology adoption in the retail sector than previously believed, there was also negative experiences and a lot of discussion around blockers that prevented the technology adoption being fully successful or fully implemented throughout a business. When considered purely against the UK retail sector, Interviewee E stated that as a manager who is responsible for approving technology adoption through their business; "*we've looked at all sorts of stuff that would facilitate access and egress to site, managing quality differently, managing reporting scope surveys. Just trying to make things more efficient for our guys on the ground, lots of great ideas. And I think that sounds amazing. But in our world, that's just not gonna fit."*

Interviewee E also discussed the reasons why such technology adoption does not see fruition and discussed the complexities of UK retail and the heterogeneous approach, resulting in a complex layer of challenges when trying to implement technology. When referring to previously tested technologies they stated that the technology had *"just become a blocker. It just didn't actually make people more efficient and slowed them down. So immediately we switched it off, because it just doesn't work. So definitely, there's definitely appetite and interest to be more efficient and improve productivity of our guys, but to roll it out across all of our [retail] projects, that is, every single one of them are different. And so, one size doesn't fit all".*

In response to the literature review findings, the data collected has revealed that within the UK Retail Construction sector, people seem to have a lot of experience with technology adoption and the vast majority appear to have not only been part of technology adoption processes, but also agree that technology adoption is increasing throughout the sector at present. Therefore, the perception that there is a lack of willingness or reluctancy to drive technology adoption within the industry may be misaligned (CITB, 2018; Loosemore, 2014).

There are numerous accounts within the field of literature where UK construction is discussed to have a lack of technology adoption and implementation (CITB, 2018; Farmer, 2016; Lai, 2017; Loosemore, 2014; Mitropoulos and Tatum, 1999; Samad et al., 2018). As such, for the data collection to corroborate this understanding, the questions relating to experience of technology adoption and implementation would be expected to be received either with the overall consensus that there is limited experience, or that the individual experiences discussed would be predominantly negative towards the technology adoptions.

When the data gathered is compared to the findings of the literature review, where Novotny (2019) claims that "*technology is one of the easiest ways to make smarter business decisions and improve productivity in construction more so than other industries*", it can be seen where the discrepancies between the theoretical approach to technology adoption lie. As a potential solution to increasing productivity (Farmer, 2016), or a more practical approach of successful technology adoption. Where technology is to be implemented through a real-world business and applied effectively to see its true benefits, understanding the barriers which prevent successful technology adoption is a critical factor to be considered (Hardie and Newell, 2011). It is this difference in consideration, between the lack of effort to adopt new technologies (Hargrave, 2017) and the real-world barriers preventing successful adoption and implementation (Seidu et al., 2021) where the discrepancies lie.

From the data gathered, the primary data findings allude to people's opinion that technology implementation is progressing at an increased rate and that there is a positive attitude toward technology adoption to increase productivity. This contradicts the literature review findings, which refer to a cultural reluctancy and unwillingness to try to adopt new technologies through the sector (Farmer, 2016). It is understood from the analysis that there is in fact a willingness to adopt new technologies to improve productivity, but the barriers and constraints that the sector face are preventing this from being completed to full effectiveness.

5.3. SPECIFIC TECHNOLOGIES UTILISED IN UK RETAIL CONSTRUCTION

From the literature review, certain technologies were identified to further analysed against the data gathered. The most prominent technologies discussed within the literature review (Cloud Based Information sharing, Off-site fabrication and Augmented reality) were posed into the survey questions, to establish experience from respondents on these technologies, the responses indicated that the generalisation was not transferable to the specific retail sector.

As can be seen from the responses to the survey questions, the experience of the chosen technologies in the retail sector is minimal. Cloud Based Sharing being the most popular of the technologies, seeing the most experience from respondents. This could be as a result of the rise in general communication and information sharing technology, which includes a format of cloud-based sharing as a standard approach (Wong et all, 2014). Also, another key factor to consider was the timing of the survey questionnaire being issued, being 2020, after the first lockdown caused by the Covid-19 Pandemic. At this time, there was a significant increase in technology adoption and utilisation for online communications and information sharing to combat the impact from the Covid-19 and lockdown restrictions in society (Debata, 2020).

The other technologies saw a much lower response of experience within UK retail from the respondents, with mixed reality in construction delivery – being identified in the literature review as one of the top technology utilisations in general UK construction (Wang et all. 2013) – seeing 0% of the respondents having experience using this technology within the UK retail sector.

From the interview responses, in review of the initial technologies discussed in the literature review, only cloud-based information sharing and off-site fabrication was discussed; with Interviewee C discussing the growing demand for DFMA (design for manufacture and assembly), and being a key technology they believe having a *"drive and demand from [clients] and businesses"*. This growth in off-site fabrication correlates with the findings from the literature review, showing the demand for off-site fabrication to increase productivity in construction organisations and the benefits that can be seen for utilisation such technologies.

The key technologies utilised in the UK retail construction industry, as identified in the literature review of this thesis were identified as 'Paperless technology', 'Augmented Reality' and 'Automated and Off-Site Fabrication'. These were identified and derived from multiple sources of literature (CITB, 2018; Farmer, 2016; Hargrave, 2017; Novotny, 2019) and discussed in the literature review. The main issues with identification of technology within UK construction is the specific constraints faced within the retail sector and the challenges this imposes on the implementation of technologies, that otherwise would be readily utilised throughout the industry (Pike, 2015). These constraints resulted in contradictions between the general construction industry and the more specific UK retail construction sector. These differences can be seen in the analysis from the findings of the literature review and the survey and interview responses.

The other technologies that were discussed in the interviews were commercial measuring software, laser scanning, clash detection software, information sharing and reporting software and BIM software. Whilst these software are prominent in the industry, the lack of correlation between the specifically identified technology from the literature review and the survey and interview responses shows a discrepancy between the theory and practise within the UK retail

construction sector. The constraints of the retail sector prove more demanding when considered against certain technology implementation then others (Goh, 2019) and it is deduced that these constraints and barriers within the retail sector influence the technologies that are successfully utilised and implemented differently to the other construction sectors.

The data gathered from the survey and interview responses provided insight into which technologies are being utilised through the retail sector. The specific technologies identified from the primary data were also identified within the literature review findings. However, the key technologies which were identified in the literature review were different to the findings from the interview and survey and so did not align to the expected findings. It is believed that the constraints imposed within the retail sector, result in specific technologies being required to the general construction industry.

5.4. KEY SUCCESS FACTORS (*ANALYSIS AGAINST TAM MODEL FACTORS*)

It has been discussed that the success factors of technology adoption are crucial to allow organisations to implement technology effectively to subsequently improve productivity. With discussions such as from Novotny (2019) stating that technology adoption is "*one of the easiest ways to make smarter business decisions and improve productivity in construction more so than other industries*" (CITB, 2018; Farmer, 2016; Hargrave, 2017; Ness, 2010).

When discussing the key success factors in literature, Skibniewski and Chao (1992) discuss that "*It is difficult to quantify the intangible benefits of advanced construction technologies and the risks involved in implementing such technologies with the use of traditional economic analysis techniques*". The barriers of technology adoption within construction technology adoption make it difficult to put a 'one size fits all' style of success measurables on technology adoption within UK Retail construction (Lee et al., 2003; Wiper, 2012).

As shown in Figure 2.5, it can be seen that the key success factors defined in the TAM model are the; (Davis, 1986)

- 'external variables,
- 'perceived usefulness',
- 'perceived ease of use',
- 'attitude towards using [the technology]'
- 'behavioural intention to use [the technology]'

The "actual system use" would then be considered the technology adoption applied through the organisation or project and therefore not considered in the following discussion.

5.4.1. EXTERNAL VARIABLES

From the survey and interview questions and responses, the impact from external variables from the wider environment was limited. However, the discussions and responses received discussed more direct external variables, such as client or project constraints, which could be in turn derived by wider environmental issues or constraints.

Table 5.1 shows the identified external variable that were highlighted from the survey responses;

Table 5.1; External Variables identified from Survey Responses to Question 7

External Variable	Response
Existing Building Constraints	*"I believe it's due to the scale of the project, the complex nature of existing buildings, it's easier for people to revert back to what they have always done, rather than embracing new technology which would improve productivity."*
Short Time Constraints	"*time is such a critical factor, particularly within fast-track jobs with short duration. I feel people like to stick to tried and tested methods"*.
Cost constraints	"*It is generally not cost effective. The Retail sector is quite tight budget wise and does not offer much movement for this opportunity".*
Client Influence	*"Clients are averse to spending either time or money in this investment when the fit-out has only a limited lifetime, particularly in existing buildings which are substantial obstacles to "clean" design which can readily adopt new technologies".*

From the interview responses, similar factors were discussed with the main factors that relate to external variables being, 'Client Influence', 'Time Constraints' and 'Cost'.

Interviewee B discussed the client influence being a main success factor and constraint, highlighting that "*one of the biggest problems with the retail side of things is your client almost dictates your program to a large extent. And so, you can't build in any innovation or adoption technology because you're only safe way of delivering it is the way you deliver it before".* They then stated that "*success factors have always got to be measured against what was done before*". Interviewee B discussed that the risk of technology adoption should be considered against the barriers and potential success factors, with consideration of the external constraints imposed on the project or organisation.

Interviewee E discussed the scalability of projects having impact on constraints, which in turn determined the viability and success of technology adoption. They stated that "*if you've got some real lumpy multi million pounds static sites, you can roll out all sorts of innovation. But if you're doing 1000 plus projects a year. It has to be scalable, has to be transferable, it has to work in a [retail sector] environment."* This determination of scale and constraints when considering the retail sector against other sectors, is a key success variable and factor that can directly determine the viability for technology adoption within the retail sector (Pike, 2015)

The external variables can play a large part in the success of the technology adoption process, primarily at inception stages (Sertyesilisik, 2017). External constraints of environments factors can impact the viability of technology adoption both specifically to the individual technology and more generally across organisations or sectors (Pries and Janszen, 1995). Examples of environmental factors, such as economic recessions and national or global events can subsequently impact the likelihood of success of technology adoption, sometimes before it has even begun. Pries and Janszen (1995) discuss that "*for builders, a clear relationship with their environment is shown. When these external circumstances are positive the industry is apparently very capable of innovation*". One such example of this was the recent Covid-19 pandemic. Where the Covid-19 pandemic impacted the economy and saw construction output fall by 16% (ONS, 2021). This fall in output and uncertainty in commercial stability for organisations results in less technology adoption as a whole for this period (ONS, 2021).

The factors discussed by the survey responses and the interviewees, whilst not engaging the wider external variables for the nation or industry, do correlate with the literature review findings on the importance of external factors during the process of the technology adoption (Crawford & Vogl, 2006; Pike, 2015). The interviewees and survey respondents focused more of project specific variables, but it can be deducted that these factors then have an impact on the overall organisational strategy of technology adoption as they pertain to the UK Retail constraint factors (Seidu et al., 2021). Therefore, these external variables must be considered as factors in the technology adoption process, along with the wider variables and constraints.

5.4.2. PERCEIVED USEFULNESS

When considered against the survey responses, the perceived usefulness of technology correlated with the intention to utilise technology to the betterment of organisations and projects. The response rate for question 9 – which asked the respondents whether they believe technology can directly help productivity, delivery and success of a project, if it is used correctly – resulted in 100% of the respondents answering on a level of 'Yes'. This shows an understanding of benefit and willingness to implement technology and therefore aids in the process when technology adoption is implemented through an organisation.

From the interviewee answers, the success factor relating to perceived usefulness came up with all interviewees, stating that the 'business case' was a key factor to consider when implementing technology adoption. From this business case the perceived usefulness can then be measured as a success factor directly against its use, to solve a problem. Park and Park (2020) discussed the need for individuals to understand the requirements of the technology that is being adopted, to influence their perceived usefulness and aid in the successfulness of the overall technology adoption process.

Interviewee D stated that when considering the technology adoption process, key questions that are asked by the organisation when discussing the business case are "*what are the rewards, or the benefits?"* These questions relate directly to the perception of usefulness against a business case. The individuals who are involved in the technology adoption are key to a successful adoption process and along with perceived usefulness having a direct impact on success rate of the adoption, it also contributes to the individuals and organisations attitude towards a technology. This in turn plays a part in the successfulness of any technology adoption.

Interviewee B discussed the need to educate people from the outset, informing them of the business requirement of the technology adoption to change the perception of its usefulness. They stated in their interview; "*if you want this to succeed, you need people to understand why we're doing it, will be the first thing, aside from what is gonna change part of their role. The 'why you're doing it in the 1st place' is critical, because if they understand why you're doing it and agree with it, then straight away your barrier starts to come down."*

The perceived usefulness can be considered one of the most important success factors when looking at technology adoption generally, with every technology adoption process requiring a business case which with key decision making through the process, looking always at whether the technology will be useful and worth its investment (Gu et al., 2015).

When considering against the purpose of this thesis, it is the perception of technology – being able to combat the low levels of productivity within UK construction – that is one of the core principles of this discussion. It is widely perceived in literature that generally, technology will increase an organisation or project's productivity, where adopted and implemented successfully (Farmer, 2016; Hargrave, 2017; Novotny, 2019). However, when discussing this directly from the research findings, the individual adoption process and usefulness against a business requirement was discussed in detail throughout the responses.

From the survey and interview responses, there is a direct correlation of the importance of perceived usefulness as found within the literature review. Whilst in literature the focus is on the individual's perception of a technology and how useful it is to that individual, (Davis, 1986) the focus from the interviewees was more towards business requirement of a technology and the perception of how useful the technology was to achieve this.

This discussion more on the business requirement, may have been relative to the sample group chosen, being all managers within retail construction organisations, so therefore considering the technology adoption from a manager or business position rather than an individual or end user position. As such, the overall consideration appeared to still correlate through the literature review, the survey responses and the interviewee responses, showing the importance of the perception of usefulness as a success factor of technology adoption.

5.4.3. PERCEIVED EASE OF USE

As identified in the TAM model, the perceived ease of use not only contributes into the overall success of technology adoption but is a contributor to the perceived usefulness. Without the perception of ease of use, the perception of usefulness can be constrained.

When considering this factor against the survey responses, there were instances where respondents clearly identified the importance of 'ease of use' against the general requirements. One respondent answered to question 7 – when questioned about why technology is not as effectively utilised on retail projects – they answered; *"We believe it's easier to implement better technology and less labour-intensive route on new build."*

Another answer to question 18, where the survey asked the respondents whether they would implement new technologies on a new refurbishment project, one respondent answered; *"it would be lengthy to implement, however if the technology was easier to use and more accessible it would help the overall progress and could potentially solve issues before starting on site".*

These answers from the survey questionnaire show the importance of perceived ease of use to the respondents. Where they clearly perceive technology utilisation to be 'easier' on a new build project rather than a typical retail project, which typically has more constraints imposed upon it (Pike, 2015). It also shows that where individuals believe technology would be easier to use, they believe it would solve issues and benefit the project or organisation.

From the interview responses a similar result was found, with the 'ease of use' being considered a key success factor in technology adoption, through most of the interviewee's responses. When discussing what they believed were the most important success factors, Interviewee C stated that they believed key factors were; *"finding a use case for it early on and doing a test sample for users; - Is it easy to use? – Can you apply it to your job? – Do you know which literally which buttons do you press to make it work and you work that out as if the UI mean interface of it? If it's a software for example, or an easy to use, it's a piece of hardware like a drone that scanning for example, or a robotic service hole driller. Is it easy to use and press the buttons within the hardware itself?"* Interviewee C then continued to discuss*; "User interaction with the technology is key. If you're building a piece of technology from scratch or building your own one like a power BI calculator tool or something like that. It's designing it from the outset so that it's easy to use and you're gonna roll it out to the people."*

When considered against this thesis rationale, reviewing technology adoption within UK retail construction, the perception of ease of use becomes a more considered factor then technology adoption within the wider UK construction industry. This is due to the constraints imposed on the retail sector and its projects resulting in issues when transferring technology across projects from different sectors (Wiper, 2012). For this reason and the constraint imposed on the retail sector, contractors have typically chosen to adopt a 'tried and tested' method through organisational and project management rather than taking risk, adopting new technologies or

methods (Bakry et al., 2014). This lack of willingness to adopt and utilise new technologies can sometimes be considered against previous experiences, where technology adoption has caused issues for project or organisations due to individuals not being able to easily manipulate or utilise the new technology. This negative experience can often occur in the retail sector due to the time constraints and parameters imposed upon it.

When technologies that have been adopted and utilised successfully within other sectors are transferred to the retail sector, the constraints of the projects can impose issues with technology making them far less suitable to use and cause issues with implementation. Park and Park (2020) discussed that "*the unsuccessful utilisation of technologies can often compromise technologies reputation and can create cultural barriers for adoption when implementation is attempted*". These experiences can often result in individuals and organisations to be more conserved with a perception that the use of technology causes issues rather than solutions (Lee et al., 2003).

The importance of perception of ease of use is considered one of the key success factors in both literature and corroborated in the survey and interview responses gathered. As previously mentioned, the overall perception of usefulness can be considered more important to the overall successfulness of the technology adoption (Davis, 1986). However, without the ease of use being perceived favourably, the perceived usefulness may be impacted, and the technology adoption success hampered. There is a clear correlation between the TAM model, literature review and data findings showing that within the retail construction sector, perception of ease of use against can be considered a critical key success factor for in technology adoption.

5.4.4. ATTITUDE TOWARD USING NEW TECHNOLOGY

The attitudes towards using the technology were infrequently discussed in the survey responses, as the attitude can be culmination of the other factors, which were mentioned and discusses more prominently. However, there were responses which alluded to the attitude being a key success factor with their responses being positive towards the technology adoption. One respondent from the survey question 18 stated, in response to whether they would implement new technology in future projects; *"I feel [new technology] can bring real benefit, but all stakeholder groups need to buy into it."*

Whilst another respondent, in response to question 7, asking why they believe retail construction sees a limited utilisation of new technology, stated; *"I think that the fast-paced nature of the refurbishment and fit out industry does not lend itself to having the time required to adapt and learn. I think there isn't the money in projects to invest into the technology. I also don't think the potential benefit will be tangible on said refurb or fit out projects."*

From the responses received, it can be seen that the general attitude towards adopting and implementing new technology is predominantly positive. This could be as a result of the perception of usefulness and ease of use, along with experiences of previous technology adoption, either positive or negative. The result is that the attitude towards technology adoption from the survey responses appears dependant on the business case and specific technology and as a general consensus. The individual responses are mainly positive to the ideology of technology adoption, but the comments provided outline identified barriers of the process. When discussing the more general technology adoption subject, previous individual experiences seemed to impact the general attitude, which has been discussed in previous literature (Younghwa et al., 2003).

The Interview responses had a mixed response to the attitude of technology adoption. With experiences being discussed as primarily positive, but some interviewees stating that they had negative experiences, which influence their attitude.

Interviewee A discussed the individuality of personal preference and perception when considering the attitude towards technology adoption. They stated that *"if you ask every different person, they will all say they use something else and it's the best thing; and it's finding that balance, there will be many people swear by their scale rule. They will always measure with that, and they don't want to use a technology."* They continued to discuss the importance of individuals experience and preferences which influence the attitude of the individual technology adoption process and can cause barriers in the process.

The attitude to use technology has many factors that contribute towards it. The attitude of individuals or organisations to adopt and implement a technology can be influenced by the factors as shown and outlined in the TAM model; being the external variables, perceived ease of use and perceived usefulness but can also be impacted by an organisation's absorptive capacity (Zahra and George, 2002).

The attitude towards using technology adoption, also known as the 'general impression' is a culmination of the perception and external factors of the technology providing the individual or organisation a view on whether the technology is worth the investment or not (Aboelmaged, 2009). This attitude toward adoption can often impact the decision to accept and implement a technology against a business case, or alternatively influence the decision that the technology does not suit the requirements (Younghwa et al., 2003). When considered against the responses from the survey and the interviews, the attitude towards using the technology was considered among many of the responses and had a varied approach, which without context against a specific case study, would be difficult to identify a clear consensus of attitudinal behaviour.

In the literature review section of this thesis, the attitude of individuals towards technology adoption can be considered as a key success factor, being a pivotal integration of the process of technology adoption and impacting the successfulness of it (Davis et al., 1869). When reviewing the data collected from the surveys and interviews, it was difficult to directly see the corroboration or contradiction against the attitudes towards technology adoption, as this is primarily made up from responses against the other factors and not a distinguished item that was directly discussed. This would typically be specific to individual technology, business cases and situations (Aboelmaged, 2009). However, when considered against the more general technology adoption, whilst there was not a direct comparison to make, the general discussions both showed the importance of the attitudes when progressing technology adoption and implementation through organisations and individuals, identifying this success factor and consideration in the technology adoption process as a defining element.

5.4.5. BEHAVIOURAL INTENTION TO USE

Question 14 asked whether the respondents believed technology will benefit the retail sector in future years and the sector will become more productive as a result of this. The respondent's majority response was in agreement, or strong agreement that technology will benefit the sector, with only 3.23% stating they neither agreed nor disagreed with this question and 0% answering that they disagreed.

To then further corroborate this response, question 18 asked the respondents if they would implement new technology in a future retail project, which has the known constraints as discussed within the literature review. From this question, 96.77% of the respondents answered 'Yes', showing a clear consensus across the respondents that again, contradicts the behavioural and cultural constraints that were identified within the literature review. This response from the survey contradicts the findings of the literature review as it shows a clear willingness and belief that technology adoption and utilisation is the potential solution to increase productivity in the retail constructions sector.

When analysing the responses of the interviews against the identified behavioural constraints, the responses were similar to the survey responses, with most interviewees answering that

they would promote technology adoption, and there being little response to indicate reluctancy in technology adoption as the literature review had alluded to.

When considering the transfer of technology adoption across multiple sectors and industries, the behavioural and cultural distinctions must also be considered. Interviewee E discussed the need to review the retail sector individually and not compare it against other industries, such as manufacturing, stating that *"everybody straight away in their head is thinking, well, they can do it over there. Why can't we do it here? I"s almost going back to going back to the Stone Age, I understand what our industry is and it's so people focused, lots of people have lots of drive and energy and hot air, but lots of other people have different terms under which they're engaging. And their first priority is to look after and protect their own business first."* This priority of business protection and the risk adverse approach feeds into the cultural and behavioural decision making. In a sector that can be considered volatile and already high risk for contractors (The construction Index, 2018), a risk adverse behaviour has evolved within contractors' mindsets, to survive the difficult parameters imposed on them, resulting in reluctancies when looking at willingness to take risks and drive technology adoption.

Interviewee D discussed the reason for behavioural challenges on technology adoption being mainly down to the perception of the individual technology and the experiences held by the end users, creating a culture from failed or irrelevant technology adoption in past experiences. They stated that they had seen that businesses *"get this new gimmick and it is a fancy bit of kit, they spend loads of money and it's not really used because actually it's not really solving an issue or problem."* They discussed that this implementation of technology where it serves no solution to a business case, then creates a culture of reluctancy in new technology, as individuals and end-users do not see direct benefit from new technology adoption and therefore cannot see the potential usefulness.

Interviewee B, on the other hand, discussed the cultural approach directly stating that *"we're inherently quite an old school kind of industry, and I think it's more of a generational thing."* This also correlates with the literature review findings, where researchers discuss the need for businesses to overcome their technology adoption barriers, by undertaking a cultural and behavioural change (Chibelushi, 2018).

One of the key traits of the UK Retail Construction sector when discussed in the literature review, was the behavioural culture and systemic approach to change, being of a more traditionalistic approach rather then progressive, when considered against new technology adoption and implementation (Bakry et all., 2014; Ness, 2010; Teece, 2009; The construction Index, 2018). This is a key consideration and primary success factor in the technology adoption approach (Lee et al., 2003).

When considering the behavioural intention to use, against the TAM model, this is the defining point in the process in which an organisation or project determines the actual use and implementation of the technology to be utilised (Davis, 1986) and as such, is determined by all the predecessors within the process before it (Chibelushi, 2018). However, the behavioural approach and culture to the technology adoption may still find that there is a cultural influence at this point in the process that can critically impact the decision or successfulness of the technology adoption unless considered and mitigated through the process (Parente and Prescott, 1994; Teece, 2009).

Within the literature review, it was identified that there is a need within the UK retail construction sector to realise and change its behavioural and cultural approach to technology adoption (Chibelushi, 2018). This cultural barrier often leads organisations to lean towards the 'tried and tested' technologies and methods of construction, rather the opt for adoption of new technologies. The unsuccessful utilisation of technologies can often compromise both technologies reputation and can create cultural barriers for future adoption attempts (Park and Park, 2020). The literature review section discusses the construction industry generally requiring this cultural shift (Farmer, 2016; Hargrave, 2017), and it is believed as part of the

research findings that there is a clear requirement for the retail sector to undergo a more significant shift, due to its more culturally bias perception and attitude to technology and risk (Bakrey et al., 2014).

When comparing the research findings from the data gathered, to the literature review findings, there is a correlation in the findings from the interviews, but contradictions from the more general survey responses, that behavioural intention to use technology does have cultural barriers. Whilst the survey responses gave a unanimous response that respondents believe technology adoption will benefit projects and organisations in the future, the interview responses gave examples of the need for cultural shifts within the UK retail construction sector, which was aligned with the findings from the literature review.

5.5. BARRIERS TO TECHNOLOGY ADOPTION IN UK RETAIL CONSTRUCTION

When comparing the survey responses along with the interview answers against the literature review, the following barriers to technology adoption within the UK retail construction sector were identified as shown in table 5.2;

Table 5.2: Technology Adoption Barriers Identified

Barrier Identified	Literature Review	Survey / Interview	Discussion (Literature vs Findings)	Identified Solutions to Barriers
Unique Project Parameters (heterogeneous approach)	Verzhbovskiy and Reshetnikov,, 2017; Bakry et al., 2014; layse and Manley 2004; Bygballe and Ingemansson, 2014; Hargrave, 2017; Loosemore, 2014; Sertyesilisik, 2017; Skibniewski, Chao, 1992	Yes / Yes	There was a correlation between research findings and literature review. However, the literature review does not specifically discuss the Retail sector constraints. The findings identified how the specific project constraints can impact technology adoption at project level, creating a more significant attitude towards using technology, which was not fully discussed in literature.	Where technologies advantages can overcome the barriers faced with heterogeneous parameters and existing building constraints is where technology can influence management techniques, or control measures, processes and non-physical benefits. It is understood that these advances, unlike practical technologies, can transfer between projects through organisational change. These technologies could be focused for retail projects, as the benefits can be transferred across multiple projects, negating the barriers of the heterogeneous effect and being relevant and beneficial across multiple projects of different constraints. (Interviewee E; Bakery et al., 2014; Lee et al., 2003)
Existing Building Constraints	Mann, 2018; Pike, 2015; Bakry et al., 2014; Construction Index, 2018; Seidu, Young et al., 2021;	Yes / Yes	There is a direct correlation between literature and the research findings. The literature review does not discuss the constraints in detail, whereas the findings identified that some projects may have limited technology adoption capabilities due to this factor.	
Cost Constraints	Araici et al., 2017; Seidu et al., 2021; ai, 2017;	Yes / Yes	Within the literature review, this factor is discussed at length. Whereas the findings identified that cost constraints were only limited to the case study and if the perceived	For organisations to overcome the cost constraint influences and barriers, it has been discussed that the initial business case must be considered and reviewed against the entire lifecycle of such technology. The initial investment should be reviewed against the

			usefulness against the business case was proven, cost constraints would be a limited barrier.	return on investment to understand its tangible advantages. Once these benefits are understood. The findings of benefit against a business case should be conveyed to the stakeholders involved in the technology adoption process – this should then see a greater success rate in technology adoption. (Interviewee B; Interviewee E; Survey Question 18 results, Seidu et al., 2021)
Client Influence or Constraints	Yisa, et al., 1996; Seidu et al., 2021; Elliott, 2018; Wiper, 2012	Yes / Yes	Client influences is discussed in both the literature and findings, both in agreement that client constraints or influence is one of the biggest success factors or barriers.	For contractors to overcome this barrier, there is a need for clients to understand and align with the technology adoption drive. Contractors can help achieve this in a number of ways, but primarily it is for contractors to push these changes if they want to see change in culture from clients. They can do this by promoting technologies with clients, to actively show the benefits that can be achieved in utilising technologies, sometimes requiring a case study approach or an upfront commitment of cost or time input to ensure the successful adoption, but inevitably providing evidence for clients to understand the need. (Interviewee E; Yisa et al., 1996; Elliott, 2018)
Fast Timescales	Pike, 2015; Lee et al., 2003; Mossman and Sarhan, 2021; Wang et al., 2015	Yes / Yes	The fast timescales of retail construction are discussed within literature, but the impact on technology adoption is discussed less especially in consideration to the retail sector. Within the research findings, the fast timescales of projects is a key factor or barrier that was identified.	Where contractors can provide a solution to this barrier is by clearly identifying and allowing for a suitable programme for technology adoption. It is here where contractors can look to implement the Technology Adoption Model (TAM) as a conceptual framework model to understand the specific requirements necessary for each technology implementation. Timescales can then be allocated to the steps of the model and the business case to ensure the adoption process is planned and managed effectively. (Survey Question 7 response; Interview B; Lee et al., 2003; Lee, Migliaccio, 2018
Cultural Bias against new Technology	Dulaimi, 2007; Straub, 2009; Pries and Janszen, 1995; Pata et al., 2016; Park and Park, 2020;	Yes / Yes	The literature review identified discussions around the cultural barriers in UK construction technology adoption and the need for cultural change. However, in the research findings there was a consensus that the sector is willing to utilise technology for change, but the barriers that the sector faces are preventing this from being successful.	To overcome the bias and reluctancy seen within the UK Retail Construction sector, contractors should produce, identify and review case studies or trials of the specific technology, working in real-world situations. This will then establish a certainty that this technology can solve the business requirement. The results of such case studies should then be shared with the end users. By including the end-users in the findings, contractors can aim to resolve the 'perceived usefulness' and 'perceived ease of use' factors of the TAM model, aiding in the

				successful technology adoption process and overcoming any bias or reluctancy shown by stakeholders or end users. (Interviewee C; Egbu et al., 2001; Parente and Prescott, 1994; Teece, 2009)
Experience Influenced Reluctancy	Awwad et al., 2022; Fewings, 2012; Park and Park, 2020; Pries and Janszen, 1995;	No / Yes	Within the literature it was discussed that past experience of failed technology adoption can create barriers in future adoption. This was corroborated in the interview findings, but not discussed in the survey responses. This was considered more due to the survey questions then disagreement with the factors impact.	
Risk Considerations against Project Success	Skibniewski and Chao, 1992; The construction Index, 2018; Pries and Janszen, 1995; Bakry et al., 2014;	Yes / Yes	The reluctancy for technology adoption due to risk on a project or organisation was a consideration identified in all findings. This was highlighted as more of a key factor in retail sector from the interview findings, then discussed in literature.	The way in which contractors can overcome any issues in perception, when reviewing the technology adoption through the lens of the TAM model, is to engage with any end users or decision makers that can influence the successfulness of the technology adoption process and communicate the business case and potential business or project problem that can be overcome with the use of this technology adoption. (Interviewee A; Interviewee D; Younghwa et al., 2003; Aboelmaged, 2009)
Lack of Understanding / Training	Lai, 2017; Sharifi, 2018; Loosemore, 2017; Fewings, 2012;	Yes / Yes	The literature review discussed the lack of training as a factor in technology adoption. However, the research findings highlighted this factor more of a communicational factor, to be addressed as part of the process and not necessarily a barrier if carried out correctly.	Contractors can influence the successfulness of technology adoption by overcoming the barrier of lack of understanding and training. They can do this by communicating with the relevant stakeholders the business case, the technology benefits and any knowledge and training required for the technology. If this is done prior to the technology adoption process starting, the perception of the stakeholders can be influenced to promote the adoption. (Interviewee C; Sharifi, 2018; Fewings, 2012; Lai, 2017)

From the Survey responses, there was a clear correlation between the barriers that were identified within the literature review section and the responses from respondents. The primary barriers that were identified were cost constraints, client influence, fast-paced nature of projects and the specific project constraints of the retail sector. One survey response to question 18 summarises the barriers that they believe are found, by stating that they, *"think that the fast-paced nature of the refurbishment and fit out industry does not lend itself to having the time required to adapt and learn. I think there isn't the money in projects to invest into the technology. I also don't think the potential benefit will be tangible on said refurb or fit out projects."*

Subsequently, the interview responses that were gathered also correlate with the survey responses and the literature review identified barriers. Some of the key barriers identified are the cultural aspects and the specific constraints on the projects and organisations, imposed by the characteristics of the retail construction sector.

Interviewee B discussed the cultural barriers and the barriers of individuals from their own previous experience, stating that *"you can't negate the value in experience, but that experience will fall back on how we delivered it this way before, so therefore we'll deliver it this way again to be sure that we will deliver it. And so, I think that that is a barrier. It's a cultural thing."* They corroborated that from individuals experience of technology adoption, when previous technology has been unsuccessfully adopted or the implementation is not successful, this can create behavioural barriers from individuals, that when culminated through multiple individuals and organisations can create significant barriers that lead to unsuccessful technology adoption.

Interviewee E discussed the challenges and barriers presented through organisational changes and restrictions on technology as a specific entity. Stating that there is multiple barriers; *"there's IT barriers, legal obligations, security limitations, change control process and then people".* They discussed the process of technology adoption and the multiple stages for an organisation to sign off or approve prior to the technology adoption being implemented to end users, which then has its own challenges once released for implementation. This correlates with the findings within the literature review on security concerns being a preventative of technology adoption due to perceived threats (Mahamadu, Mahdjoubi and Booth, 2013)

Further to this, Interviewee E discussed the retail sector specific challenges and barriers and the constraints that the projects impose on organisations, stating that; *"No one construction project is the same. You go now to the iconic Battersea Power Station; 160 brands going in there – Do you reckon any of them are exactly the same? And people talk about churn, efficiency, modelling, keeping everything the same. It's not – every single one of those units is different because invariably… each of the projects themselves, by design, from shop front and all the internal, and all their needs and requirements, they are wholesale different. Therefore, the job is different again; going back to that classic, 'not one project fits all'."*

Another key barrier and aspect to construction projects that was discussed in the interview with Interviewee E was the focus on supply chains implementing technology. Whilst contractors can adopt new technology, where this may impact site process or change, this would need holistic buy-in from the supply chains and partners. Interviewee E mentioned that "*we use a lot of the same sort of supply chain, but I personally don't think we understand them fully*", discussing that where new technology is to be adopted or implemented, contractors need to understand the intricate workings of supply chains and processes to understand the full impact and barriers that this can impose at implementation stage.

It has been discussed in literature that as part of the technology adoption process, there are many barriers that prevent successful adoption and implementation of new technologies (Ahrweiler, 2010). These barriers are relevant to the constraints of an organisation's environment and their individual end users behaviours, as well as processes and business requirements through the process of the technology adoption (Venkatesh et al., 2003).

When considering the technology adoption process in the UK retail construction industry, the barriers and constraints on organisations are relative to the sector and significance of certain aspects differ from other sectors and industries (Rafiu et al., 2021). The main barriers that were identified within the literature review were the cultural restrictions of the retail sector, being a more traditionalistic approach to technology and management (Bakry et al., 2014), client impact and influence on implementing new technologies (Farmer, 2016), cost constraints (Rafiu et al., 2021), the heterogeneous nature of retail construction projects (Pike, 2015) and the fast-paced, high-risk nature of retail construction projects (The construction Index, 2018).

The most significant barriers that pertain to the UK retail construction sector are the heterogeneous nature of the projects, with each project having its own risks, constraints and parameters more so than other construction sectors (Pike, 2015). These constraints and challenges impose significant barriers on strategic approaches for organisations including management strategies and technology requirements. When reviewing the responses of the

survey and interview questions along with the information gathered in the literature review, it can be determined that there is a clear agreement on the barriers imposed in technology adoption processes in the UK retail construction sector, which will prevent successful adoption of technology unless carefully considered and mitigated through the process.

The findings from the survey and Interview provided a number of key barriers in technology adoption; cost, time, client and culture being the most prevalent barriers identified in the responses. The literature review and theoretical framework principles correlated with these barriers and provided insight into the key elements that can prevent successful technology adoption. The findings from the primary data are in line with the literature review and provide an insight into the potential solutions for technology adoption.

5.6. CRITICAL ANALYSIS OF THE TECHNOLOGY ACCEPTANCE MODEL (TAM)

The TAM framework has been discussed and utilised throughout the research of this theses and forms the basis of analysis and discussion against the research findings from both the literature review and the primary data. The benefits and advantages of utilising the TAM framework have been discussed within the literature review and the methodology chapters of this thesis. It has been discussed utilising TAM as both a theoretical framework; reviewing the research problem and findings against the impact on existing theory and literature, and as a conceptual framework, reviewing the findings against the impact to the industry and practise. However, from the research findings, the TAM framework and its limitations have also been identified.

The shortfalls of the TAM model have been discussed previously in literature, especially when considered within the construction industry (Sepasgozar et al., 2016; Park and Park, 2020; Al-Mamary et al., 2016; Bryan and Zuva, 2021). Park and Park (2020) discussed the lack of consideration from the TAM framework, for more external factors that can directly influence the outcome of the technology adoption process. They discussed this in reflection of the individual's perception and identified aspects that could alter the process, producing a newly developed model within their research. One aspect that they discussed was the requirement for the theoretical model within construction technology acceptance, "mu*st examine the external variable that reflect the characteristics of the latest information acceptors in the construction environment*" (Park and Park, 2020).

The lack of consideration of external factors within the TAM model has been discussed previously within existing literature (Tarhini et al., 2015; Venkatesh et al., 2013). To develop the model and account for such consideration the TAM framework has been amended with the TAM 2 (Venkatesh and Davis, 2000) and the TAM 3 (Vekatesh and Bala, 2008) being produced with the aim to address the shortfalls of the TAM model. These further developments of the model, along with variations through literature attempt to introduce more robust consideration for external factors that influence the outcome of the adoption process. The developed frameworks continue to focus on user behaviours and decision making. Whilst this research acknowledges the alternative models and frameworks available, as discussed in the literature review chapter, the TAM model is a simple adaptable model that provided this thesis with the grounds to provide a suitable understanding and foundation to be developed in future research.

Where the findings of this research look to contribute to the TAM model, is by understanding and identifying the requirement to consider external factors which directly affect the outcome of a technology adoption process, but do this by both influencing the users or stakeholders attitudinal outcome and also impact the overall process outcome. The key external barriers have been identified within this research (project / building constraints, time constraints, costs, client decisions), with behavioural influence barriers also identified (lack of understanding, cultural bias, experience led influence). It is the external factors that directly affect the outcome, that this research believes should be considered in the future iteration and discussion of the TAM framework against UK Retail Construction. The future aim is to develop the TAM model and create a new, construction specific model, with the basis of the TAM framework, but

including such external factors and influences that have been identified and discussed throughout this research thesis.

5.7. SUMMARY OF THE DISCUSSION

Where literature identifies barriers in the technology adoption process, there are recommendations for companies to follow processes and models to overcome these barriers and in doing so, potentially increase success rates in technology adoption within organisation and projects (Ahrweiler, 2010). The model discussed against this thesis is the TAM model (Davis, 1986), which outlines the process and factors that contribute to successful technology adoption. As such, it can be used by organisations to identify and combat the barriers for each factor (Lee et al., 2003). When considered against the literature review and the TAM theory, the recommendations that were identified and provided in both the survey responses and interviews hold correlation to the principles of the theoretical framework and literature review findings.

The interview responses provided the insight into specific ways in which organisations actively try to adopt technology. When combined with the survey responses, these can clearly be positioned within the parameters of the TAM model, to be used as a tool for organisations to follow to help implement successful technology adoption (Toole, 1998). The challenges and barriers identified from the findings show that the UK Retail construction industry have some specific constraints over other construction sectors, correlating the findings from the literature review (Ahrweiler, 2010). By identifying these barriers and showing that the findings are in line with the literature review, these factors can be further reviewed on individual basis in the lens of the TAM framework, resulting in organisations being able to utilise the processes outlined by the framework, leading to a potentially more successful adoption rate in a practical industry.

The theory of the TAM model is to predict the behaviour of individuals and stakeholders involved in the technology adoption process. It has been stated that the outcome of a decision is determined by the analysis of the benefit an individual expects to receive, compared to the effort or cost that they put in (Marikyan, D. & Papagiannidis, S, 2023). According to TAM the successful technology adoption is a process in which external factors affect an individual's response to the technology (perceived usefulness and perceived ease of use), with these factors then influencing the affective response (attitude or intention towards using the technology) (Davis, 1989). The findings from the literature review and the data gathered have provided suitable results for discussion against the framework of the TAM. In whole, the findings and analysis of the research data have correlated with the Technology Acceptance Model, with external factors being discussed as the influence of the individual's perception on technology adoption, which concludes in the individuals attitude towards the technology adoption. Where is has been discussed within this chapter that the findings differ from the TAM framework are where the external factors directly influence and impact the outcome of technology adoption (IE. Client influence). Whilst the TAM model considers the individual behaviours and influence on individuals' attitude towards the technology, it does not necessarily fully consider the factors in which are out of the individuals' control, but which can directly affect the outcome of the adoption process. It is in these areas where the TAM model can be developed to understand the principles of other factors outside the individuals control or influence.

There are many barriers to technology adoption within the UK Retail Construction sector. These barriers have been identified within the literature review and primary data gathering. This research has analysed the barriers and key success factors against the findings and where possible has identified recommendations for contractors to overcome such barriers. It is critical for contractors to understand the rationale behind the barriers that prevent successful technology adoption, to further allow them to understand the resolutions to overcome issues and barriers. If contractors can overcome the identified issues, they should see an increase in technology adoption through the sector.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1. INTRODUCTION TO CONCLUSIONS

This thesis looked to answer the question, 'what are the key barriers preventing UK Retail Construction organisations and projects from successfully adopting and implementing new technologies, and can the theoretical framework; TAM, be utilised by organisations to overcome these barriers and increase adoption, to combat low productivity levels'.

In line with the research questions, aim and objectives, the research reviewed the existing literature to analyse the perception of productivity within UK retail construction. This included the findings of key constraints that must be considered when comparing the productivity levels between other industries, noting the significant heterogeneous factors that apply to construction, which result in low productivity output perception, when compared against other industries.

The objectives of this thesis are identified as follows, with analysis and discussion on the research outcomes against these objectives;

Objective 1; To investigate the productivity issues in UK construction, looking specifically at the UK Retail sector, and review the impact that technology can have on these issues.

Objective 2; To identify how specific technologies are being utilised as tools to benefit construction organisations and projects to increase productivity.

Objective 3; To identify key barriers in technology adoption within UK Retail Construction

Objective 4; To use the TAM model to provide recommendations on how organisations can overcome the identifies barriers to result in successful technology adoption

6.2. OBJECTIVE 1; PRODUCTIVITY ISSUES AND TECHNOLOGY IMPACT IN UK RETAIL CONSTRUCTION

6.2.1. ACADEMIC IMPACT

The first objective has been completed through the stages of research of this thesis. The productivity issues have been identified from literature with significant studies showing that the "a*verage productivity levels in the construction industry have remained consistently below the UK average and have grown more slowly until recently*" (The Office for National Statistics, 2021).

Within the literature review chapter, the review of the current perceived and known issues with productivity within the UK construction industry were discussed and reviewed. It was identified that whilst there is extensive research and acknowledgement that the wider industry has a perceived productivity issue, the literature specific to the UK Retail Construction sector was limited. For the purpose of the research outcomes, the literature was reviewed in relation to the wider industry, where information on productivity issues and potential solutions was deemed relevant to the specific retail construction sector. The literature review provided sufficient evidence and research on the impact and potential resolution that technology can provide in relation to productivity issues.

From the objective set out for the research, it is believed that the research has addressed this and identified through the literature review and primary data, the understood productivity issues and the positive impact that technology can have on these issues. The findings of the research identified that the perception of the population within the UK Retail construction sector believes

that technology does indeed provide a solution to the known productivity issues. This was discussed within this thesis and can be concluded based on the findings.

The impact this thesis aims to have on the current field of literature is to highlight this gap in literature, especially specific to the UK Retail Construction Sector to productivity discussions. This thesis looks to provide an original contribution in this specific area and literature gap, to allow future researchers to apply existing and new research criteria to this area. The lack of information relevant to productivity in the UK Retail Sector is a key area that is believed to have potential for future resea4rch, as it has been identified that the constraints on the sector are more significant and strenuous then other sectors, so it is believed the sector has a unique area for analysis against productivity issues in the future.

6.2.2. INDUSTRY IMPACT

The productivity issues have been analysed within the literature review and primary data and where the findings have been identified that impact the industry it has been discussed through the thesis. As identified in the aim and objectives, one of the key purposes of this research is to provide industry organisations practical recommendations to aid in technology adoption rates, to help promote productivity through the industry and sector.

The way in which this research looks to impact the industry, relating to the first objective is by identifying the productivity issues and corroborating the findings from the literature review. It was deduced that from the primary data gathered, the findings; that there is a low productivity rate within the UK retail construction sector was confirmed. The survey and interview responses identified this productivity issue within the sector.

As outlined in the aims and objectives, this thesis looks to provide recommendations to the industry to help improve the productivity issues found. It was also corroborated within the findings that one of the solutions to the productivity issue is for organisations and industry to utilise advancing and new technologies. The recommendations that this research poses will provide the industry with the answers to these issues and provide potential solutions to increase technology adoption rates and therefore potentially improve productivity within the sector.

6.2.3. POLICY IMPACT

The productivity issues have been identified as planned within the first objective. This understanding has then been discussed in relation to previous and current policy within the industry and the specific retail construction sector. This thesis has looked to impact policy by identifying the productivity issues and providing a basis for the solution; being technology adoption. In recent years the UK government have published policies to the UK construction industry, relating to technology adoption and innovation. Some of the key policy publications are ‘The Construction Playbook’ (Gibbs, 2022) and ‘Construction 2025’ (UK Gov, 2013). The newer developed publication, being ‘The Construction Playbook’, sets out the government’s plan for public sector construction, to promote technology adoption and implementation in procurement and delivery of projects within the industry, by driving this initiative in the public sector.

The impact that this thesis looks to have on the current policies within the UK construction industry, is by again focusing and highlighting on the specifics of the UK retail construction sector and the policies that organisations within the sector implement. Whilst the policies that the UK government have released are applicable to all sectors of the construction industry, they pertain much more closely and directly impact and drive the public sectors, where government initiatives can directly influence procurement strategies and project deliverables (Lenard and Abbott, 2011).

It can be seen that in recent years, government and policy has attempted to influence and resolve the productivity issues within the construction industry. From the literature review and the findings from the primary data, this promotion through policy change has not been as

affective as its potential. The impact this thesis looks to have, is by identifying the relevance of the UK Retail Construction sector and the issues that it faces, to influence future policies.

6.3. OBJECTIVE 2; SPECIFIC UTILISATION OF TECHNOLOGIES

6.3.1. ACADEMIC IMPACT

The research in this thesis looked to identify specific technologies within UK Retail Construction Sector, to impact future research by understanding the relevance on information around technology use, within the sector. The literature review has identified some of the key technologies currently being utilised through the UK construction industry, to understand how these are being implimented to combat low productivity levels. Due to the gap in the current field of literature, without specific considerations for the retail sector, the findings pertained predominantly to the general UK constructions sector.

Where this thesis looks to impact the current field of literature is to provide a steppingstone of findings and data to fuel the discussion of what can be done to push forward the real world progression of technology adoption within retail construction sector. The information pertained specifically to the use of technology within this sector was limited within the literature research.

In recent times there is much discussion on technology adoption in construction generally and it is the intention of this thesis to impact the field, by providing an original contribution to the identified gap in the literature; being technology adoption within the UK retail construction sector specifically. This will allow researchers to build upon not only this thesis, but the ongoing development of literature in the field, and tie it back to the retail construction sector, taking into consideration the limitations, constraints and specific characteristics that have been discussed.

The research identified multiple technologies that being utilised within the UK construction industry as tools to benefit overall productivity. These were identified and reviewed within the literature review chapter. The prevalent technologies that were identified and understood to be utilised were then discussed within the initial survey to review against the population. The research identified the following technologies as being the most prominent within the UK Construction industry, as outlined in Table 2.1;

- Augmented Reality
- Virtual Reality
- Drones
- 3D Printing
- Off-Site Fabrication
- Artificial Intelligence
- Wearable Tech
- Lidar / Sensors
- Cloud Based Sharing (paperless)
- Building Information Modelling (BIM)

When the primary data was analysed, it was identified that some of the key technologies being implimented throughout the industry are not significant contributors to the Retail Construction

sector. The reasons for this have been discussed throughout the thesis, being the main barriers to technology adoption and utilisation.
The way in which this research has impacted the academic field of literature is by identifying this gap in the current field and by analysis the existing technology that was deemed to be utilised, providing a new understanding of the issues the specific retail construction face, with technologies not being able to easily transfer from other sectors.

6.3.2. INDUSTRY IMPACT

The research aim and objectives looked to identify specific technologies that can benefit organisations to increase productivity within the sector. From the literature review and the online survey, it was then deduced that the experience of the chosen populations concluded that the specific technologies were not utilised through the sector, as understood from the literature review.

When the literature review findings were compared to the findings from the primary research data – from surveys and interviews with professionals within the retail sector – there was a clear distinction that some of the key technologies in the more general UK construction industry, were not being utilised effectively within the retail sector. This was found to be because of the specific constraints that apply to the retail sector, which are less prominent in other sectors. This was a key consideration through the literature review and research findings, that technology adoption and implementation is not directly transferable between UK construction sectors.

The focus of the research developed through the process towards understanding the barriers that prevent such technologies from being successfully adopted, as was highlighted from the survey results. Where the literature was deemed to identify implementation of certain technologies, these were identified within the findings to have not been as successful in implementation than expected. Whilst the objective was not fully achieved, being that the identified technologies were found not to be as successful as initially understood, the evolution of this objectives outcomes produced further findings and discussions around the key barriers specific to the UK Retail Construction sector.

It is believed that from the findings and conclusions, that the key technologies identified within the literature review are not necessary relevant to the specific UK Retail Construction sector. These findings are believed to impact the industry, by providing an understanding that technology benefits are not so easily transferable from sector to sector and that the assumptions of generalisation of technology implementation across the whole of the UK construction sector, may not provide sufficient information. This allows contractors and organisations to understand the specific requirements of the sector and puts more focus on understanding the barriers of technology adoption so that these can be overcome.

6.3.3. POLICY IMPACT

Whilst governments policies do impact the overall initiatives that construction organisations adopt, there is still a lack of direct transfer across multiple sectors when driving such policies. In recent years the government have released new policies and guidance which directly relates to technology adoption, as outlined previously. Whilst all these policies, guidance and strategies pertain to all sectors of construction, the outline and targets against specific technologies do not consider the individual constraints, such as the barriers faced by the UK retail sector and outlined in this thesis. This can sometimes see policies fail or struggle to transfer to sectors such as retail.

An example of policies being implimented to enact change in technologies being used was the BIM Mandate 2016, which drove the inclusion of all new public sector construction projects to utilise BIM Level 2 by 2016 (UK Gov, 2017). The effectiveness and overall benefits of this policy were widely criticised due to its ambitious or even impossible targets and its lack of transfer to other sectors of the construction industry (Awwad et al., 22). This transfer of technology

adoption policies across multiple sectors is where this research looked to highlight the current gap and impact the future policy making strategy. The constraints and specific requirements and challenges that the UK retail sector faces, result in ineffective transfer of policy across the sectors, where procurement strategies differ vastly across examples such as public, housing and retail sectors (The Construction Index, 2018).

Where the lack of transfer of policies into the UK retail construction sector were identified throughout this thesis, the objective to identify specific technologies would allow for government and organisational change. If the use of technologies can be better understood the policy direction can be better tailored to the specific characteristics of the retail sector to help drive change and promote technology adoption, to continue to combat low productivity.

This research aims to have impacted on policy against the second objective by identifying the known technologies being used within the wider UK construction industry, and then by analysing how these are specifically used within the retail construction sector. By understanding which technologies are utilised and which are unable to be transferred, this thesis can impact policy by providing future policy makers with the knowledge that individual sectors, such as UK retail, must be considered outside the generalisations of the wider industry and specific policy targets must be set to such sectors to ensure that change occurs, and the promotion of technology use can be implimented effectively.

6.4. Objective 3; Key Barriers to Technology Adoption

6.4.1. Academic Impact

The objective to identify key barriers in technology adoption has been fulfilled within the research findings and discussions. Within the literature review chapter of this thesis, barriers of technology adoption were identified and discussed. However, due to the limited literature relevant to the retail sector, these barriers were predominantly discussed against the wider construction industry. The findings of the data gathering then analysed the barriers specifically within the retail sector as defined by the population and the interviewees.

There are many existing theories and theoretical frameworks which apply to the wider field of technology adoption (Ajzen, 1985; Ankrah et al., 2009; Davis, 1986; Rogers, 1995; Oliveira and Martins, 2011; Venkatesh et al. 2003). Many of these have been discussed relative to the construction industry where applicable and provide suitable discussion and theory around the relevant barriers against the technology adoption process. However, the existing literature does not cover the specific characteristics of the UK retail sector and the impact that the specific constraints and barriers have on the overall technology adoption rates and subsequent productivity of the sector. One of the key focuses of this thesis has been the specific constraints and characteristics that apply to the retail sector, which result in many general situations in construction being non-transferable to this sector. These specific constraints have been discussed through the thesis and as reviewed in the discussion chapter, were found to correlate in both the literature review and the survey and interview findings.

The key barriers that have been identified through this research, both within the literature and the primary data have been discussed in relation to the specific sector, with Table 5.2 outlining the results and findings against each data set. The impact that this research has on the field of literature is by providing the knowledge and understanding around the barriers on technology adoption within the specific UK Retail Construction sector. This knowledge bridges an identified gap in the current field of literature and allows future research the basis for developing more relevant research and frameworks. The use of the TAM theoretical framework has been reviewed against the academic knowledge and the shortfalls of the existing knowledge and known barriers has also been discussed, with the impact providing basis for future development of theoretical frameworks and literature.

6.4.2. INDUSTRY IMPACT

One of the key objectives within thesis was the identification of key barriers of technology adoption, within the UK Retail Construction sector, to allow the impact against the industry or practise. This thesis identifies the known barriers and success factors identified within the TAM process, but also provides insight from the research findings for barriers and factors that may not be considered within the existing TAM framework. Whilst these barriers can be positioned within the TAM model; identified as 'External Factors', these specific factors must also be understood and considered against the process, to ensure successful technology adoption within organisations (Ford and Hakansson, 2013; Teece, 2009). The findings from the primary research within this thesis give organisations within the industry an insight into the cultural and specific barriers faced within uk retail construction, and so when combined with the TAM model process, provide organisations or projects within the sector suitable information and tools to improve technology adoption success rates.

The UK retail construction sector has been identified as "*a cut-throat business with traditionally fierce competition and relatively high risks*" (The Construction Index, 2018) and as such, has been both reluctant and unable to encompass technology adoption as successfully as other sectors and industries (Badi et al., 2021; Pike, 2015; Bakry et all., 2014). The findings of the data gathered within this thesis found key correlations between the respondents' understandings of technology adoption barriers and success factors, and that identified within the TAM model and literature review.

The critical factors were identified within the findings as the 'Perceived Ease of Use' and the 'Perceived Usefulness' from the TAM model, with respondents' statements such as from question 7, stating that "*if the technology was easier to use and more accessible it would help the overall progress",* showing the direct comparableness to the model factors. Where this correlation has impact on the industry is providing organisations a platform and model to utilise when reviewing the process for technology adoption. From these organisations can identify key success factors to improve success rates, whilst also using the model to identify and mitigate the barriers found within the model process (Davis et al., 1989).

It is believed that the impact to the industry, from the completion of this objective within the research has provided contractors the knowledge or tools to overcome the identified barriers of technology adoption that have been identified within this thesis. These have also been reviewed against the findings from both the literature review and the primary data as seen within section 5.5 of this thesis. Where barriers were identified, each recommendation has been given to provide contractors with a solution to overcome such barriers. It is understood that in doing so, this research objective was achieved, and this thesis outcome has been able to provide both rationale to the issues faced in technology adoption, but also resolution for contractors by way of recommendations to overcome these issues.

6.4.3. POLICY IMPACT

As previously discussed, the objective to identify key barriers within the UK Retail Construction industry, preventing successful technology adoption, is the basis for impact across literature, industry and policy. This is most prevalent within policy influence as the potential to influence or impact policy change requires the understanding and knowledge of the key issues and success factors of such policy.

It has previously been discussed that government and organisation policies have been used frequently to attempt to promote technology implementation through the construction industry. It has also been analysed that some of these policies have fallen short of the potential aspirations. This could be deduced that where the key barriers or obstacles preventing successful technology adoption are not fully understood, the policy objectives or aspirations are not aligned with the possibilities of such requirements.

The way in which this research and the findings is believed to impact policy, is by identifying the key barriers or aspects preventing technology adoption within the specific UK Retail Construction sector. By providing the knowledge of these barriers and the issues that the sector faces, it allows policy makers to tailor their objectives or policy requirements to promote the successful technology adoption and overcome the barriers by changing the approach to the processes. By providing the understanding of the issues, this research can impact policy in a positive way and promote technology adoption in a way to avoid the barriers preventing the success of the process and increasing overall technology adoption rates.

6.5. OBJECTIVE 4; TAM TO OVERCOME BARRIERS OF TECHNOLOGY ADOPTION

6.5.1. ACADEMIC IMPACT

Within the discussion chapter of this thesis, the TAM conceptual framework was utilised to understand and analyse the findings of the research. From this, the key concepts were discussed with the identified barriers being analysed against the TAM framework and the data gathered. As part of the discussion chapter, recommendations were provided against each of the barriers to technology adoption.

The literature review section of this thesis identified a gap in the current field of research for specific technology adoption within UK retail construction. Whilst there is continued discussions and recent theoretical development on general technology adoption within construction (Wang, Liu et al., 2022), the constraints and challenges faced within the UK retail construction sector can make it an outlier when discussing generic rules in construction and therefore lead to specific research and discussion being necessary to fill this gap.

There is currently a lack of use of theoretical frameworks that have been applied to the UK retail sector in relation to technology acceptance. As part of this thesis, the findings were reviewed in the lens of the Technology Acceptance Model (TAM) to try to determine if this theoretical framework could be applied to the UK retail sector. It was determined that there was a correlation between the expected findings - determined from the literature review and as outlined in the TAM model – and the primary data gathered from the survey and interview findings. This correlation shows that from the findings, the TAM model can be applied to the UK retail construction sector and its model can be utilised in future research to further review the sector and look to predict future trends or provide further recommendations to the industry.

The way in which this research contributes to the TAM theory, is in considering the external factors that not only influence the individual's behaviour, but also are to be considered against the outcome of the technology adoption process. As identified previously in this research, the theory of the TAM framework considers the factors that influence the behaviours and attitudes of the individual end-users, decision makers and stakeholders. However, as identified, there are factors out of the contractor's control (project heterogeneous nature, client requirements or constraints, time constraints etc.). These factors can impact the outcome of the technology adoption success, potentially more so than the individual's behaviours. It is this impact that can be considered to be reviewed with the TAM framework to understand all aspects and determining factors of the technology adoption outcome.

This research looks to impact the academic field by influencing the future research around this field of literature. As part of the development of potential future research to progress the findings in this thesis, some of the other theoretical frameworks that have been identified within the methodology section could be reviewed and the data gathered analysed through the lens of other theoretical models. There are other models that look to derive the impact of external factors such as those discussed which may be prudent to be reviewed as future development of this research. In addition to this, the findings of other research undertaken can be analysed in the lens of these such frameworks, to identify if alternative frameworks could be considered

appropriate against the aims of this research field; to analyse technology adoption within UK retail construction.

6.5.2. INDUSTRY IMPACT

The impact on the industry, from the use of the TAM framework is one of the key considerations of this thesis. From the findings of this research, it has been concluded that the Technology Adoption Model can be utilised as a theoretical framework model in the UK retail construction sector, to identify the requirements and key success factors of technology adoption for organisations within the sector. Organisations can look to this model and the findings of this research to understand the constraints and barriers faced within the sector and how these affect the overall technology adoption process, in order to look to mitigate the impact and define a resilient strategy. This thesis looks to impact the industry by providing organisations with the recommendations to improve technology adoption success rates by using the TAM theory as a theoretical model to follow to improve technology adoption rates.

This thesis has looked to use the TAM conceptual framework against the findings of the research, to provide contractors and organisations with a tool for future use when planning technology adoption. As discussed, the TAM model presents a basis for consideration and within this thesis it has been concluded that the TAM conceptual framework can be used in practise to facilitate positive technology adoption. However, the findings have also identified that some of the external factors that contribute to the success of technology adoption within the UK Retail Construction sector, are not directly considered within he TAM model. Whilst this aspect can be further researched in literature to develop a more robust conceptual framework, the existing information provided by this research provides contractors and organisations with a basis for use in practise.

Further to this and from the research findings, the analysis against the framework 'Technology Adoption Model' (TAM) was then carried out. It was then concluded that the findings from the literature review and the primary research findings, correlated with the TAM framework and subsequently corroborated that the TAM model can be utilised in the UK retail Construction sector. This model can be used as a tool for technology adoption processes within organisations and projects to improve success rates and allow for technology adoption to act as catalyst for increased productivity within the sector.

6.5.3. POLICY IMPACT

The way in which this research looks to impact policy is providing recommendation to overcome barriers by utilising the TAM framework. Within the existing retail sector, the drive for policy change can be influenced and impacted by the discussions within this research field. The outcomes of this thesis's discussion show that there is a correlation between the theoretical framework 'TAM' and the industry consensus on technology adoption and the barriers that organisations face. With some of the identified barriers being identified in survey responses from question 7, noting it is "*a cultural thing".* This is where the impact on policy change can help influence the retail sector, by introducing policies and initiatives to transform the cultural understanding of the industry and individual sectors alike. The findings from the primary data also lead for an influence on organisational policies to utilise the TAM model, to define new technology adoption processes to promote successful technology adoption through the UK retail construction sector.

By providing policy makers with a critical analysis on the TAM model against the industry findings for technology adoption, including barriers and how to overcome them, this thesis looks to give a solution for the policy makers, who may be finding difficulties in achieving successful technology adoption or achieving the aspirational policy outcomes.

From the discussion on technology acceptance through the lens of the TAM, future research and literature can look to influence current and future policies both within organisations and

from governing bodies. Where there is a current drive for sustainability within construction, led by new and developing policies (Badi et al., 2021), the influence of technology on this field can help to shape these by utilising the findings in this thesis and introduce the principles of the TAM model in the policy strategies to aid in the technology requirements for these new targets. The implementation of advancing technology is a key driver for the achievement of sustainability success within construction (Lima et al., 2021) and therefore the policy drivers for sustainability should be interlinked and integral with the policies and drivers for technology adoption, to aid in achieving the targets through the sectors. Again, looking to the UK retail sector specifically, this would be where this thesis looks for future research to build upon the findings and analyse the impact technology adoption within UK retail construction has on the success of policy targets through the sector.

6.6. RECOMMENDATIONS IN UK RETAIL CONSTRUCTION

From the barriers and success factors that have been identified throughout the findings of this research, there is a need to understand how barriers and issues can be overcome, to increase successful technology adoption within the sector. The recommendations have been based on the findings of the literature review and primary data and attributed to the academic, industry and policy sections to increase successful technology adoption within the UK Retail Construction Industry.

6.6.1. RECOMMENDATIONS TO ACADEMIC

From the data gathered, there can be seen a correlation with the TAM framework principles and the findings, with responses from the data gathering referring to the ‘exposure’, ‘easier to use’, ‘experience’ and ‘qualifications’. When reviewed against the TAM model, these can be seen as ‘perceived ease of use’ and ‘perceived usefulness’, giving a justification to the utilisation of the TAM theoretical framework for technology adoption in UK retail construction. Where contractors and organisations can identify these potential barriers and look to mitigate them as part of the technology adoption process, utilising the TAM model, they can potentially change the behavioural aspects and find that a more successful technology adoption rate can be achieved.

There have been multiple barriers that have been identified within the literature review and the primary data of this thesis that have been discussed as reason for technology adoption being unsuccessful. One of these barriers was the heterogeneous nature of UK Retail Construction projects. Within the technology adoption model, this is not directly considered as an external factor on the outcome. However, the UK Retail Construction Sector as identified within the literature review section (Hargrave, 2017), is constrained by this barrier more so then other sectors within the industry.

Another barrier that was identified within the research was the way in which the overall benefit of technology adoption is considered against the business case and the cost. Interviewee B discusses the cost benefit against its outlay as an investment that must be considered against the long-term value and not just the immediate outlay of spend. They state that when “*looking at the return on investment rather than the outlay, it's probably a more sensible. So again, it's just an education piece and ensuring you get your process right”.* They discuss that it is essential for contractors to review the technology in its entirety against the business case, prior to any investment or attempted technology adoption. When understanding this barrier and solution against the TAM model, it is the attitude towards the new technology that should be fully understood. Should the technology be sold as an extremely useful and easy to use benefit to a contractor, but the cost and spend are considered too great, the technology adoption will fail. This consideration could be considered as an external factor within the existing TAM model that influences the users attitude towards the technology. However, this can also be considered as an external factor that can critically influence the overall outcome of the adoption process and so it is believed the TAM theoretical framework does not fully account for this aspect.

One aspect that contractors rarely are able to control is the requirements, influences and constraints of their clients. Interviewee E discussed the client constraints being a significant barrier for technology adoption, stating that; "*essentially our clients are simple, as what they want is that time, cost, quality model. You know, we've seen it on projects, where they need to get it open quicker. But they want it for cheap as possible. And the quality is important for them."* This key barrier is the factors that drives client decisions and without clients being able to clearly see tangible evidence of benefit to any investment, they become reluctant to promote such changes. The client requirements and constraints can usually drive the outcome of the technology adoption on projects and so it is vital for contractors to begin to influence client decision culture on technology adoption, to see more successful technology adoption. This barrier and consideration towards the outcome of the technology adoption is not considered within the existing TAM model as it falls outside the individual users behavioural considerations.

The time constraints on projects has been identified as a key barrier that will prevent successful technology adoption. The technology adoption process is known to require a time commitment from contractors and with the known limitations on UK Retail Construction, this is sometimes a quantified barrier that is difficult to overcome (Hardie and Newell, 2011). Again, the TAM theoretical framework does not fully consider this aspect and the impact it can have on the users behaviour or attitude and the overall constraint on the technology adoption process.

Throughout the literature review and the findings of the primary data gathered, training and understanding of new and advanced technologies has been a key consideration and barrier in the process. Interviewee C stated that the biggest priority for technology adoption is "*training, training, training*". They discussed the importance of the users understanding the technology and its usability, when trying to successfully adopt technologies into a business. They then stated that engagement with end users and buy-in from key stakeholders was a key factor to prioritise when considering technology adoption and these could mitigate critical barriers through the process. Interviewee C also discussed the consideration for costs associated with supporting a change or adoption of technology. They mentioned that "*there's a consideration on it. You know, the resource that actually runs it and then the people that support it. Iti's bigger than just ohh, it's a piece of software and it costs X. It's actually what goes into the backbone and the support mechanism that sits behind it. So, it's very much a strategic implementation*". They discussed that this secondary cost of internal support and time to facilitate a technology adoption process can sometimes even match the initial input cost, so must be considered when looking at the overall strategic strategy of the technology adoption. It is understood that this consideration of training and understanding does directly fall in line with the TAM framework as it influences the users opinion of the technologies and attitude towards using it.

The way in which this thesis looks to recommend to academia is for the future development of the TAM framework and its theoretical underpinnings. Whilst the TAM model considers the users behavioural aspects, it does not fully consider the external variables that can directly constrain or impact the overall outcome of a technology adoption process. As has been discussed through this thesis, whilst many of the findings can be accounted for, utilising the TAM framework, there are aspects that have been identified as critical factors influencing the overall outcome of technology adoption that are not fully considered within the TAM theoretical framework. By developing the TAM theoretical framework to consider such external factors in its outcome, the framework could be developed to better predict and understand the potential theoretical barriers and issues that technology adoption processes face and could be developed to provide a better solution to the technology adoption issues faced, when considering the specifics of the UK Retail Construction Industry.

6.6.2. RECOMMENDATIONS TO INDUSTRY

As defined by the objectives of this research, this thesis looks to provide recommendations to contractors within the industry to overcome the identified barriers of technology adoption. The barriers have been identified and defined throughout this thesis and so to overcome the barriers, the recommendations have been split into sections relevant to each barrier.

To define the barriers, within the interviews held, the sixth question was aimed to ask the interviewee for three tips or recommendations to other potential contractors in the UK retail sector, if they were looking to adopt and implement new technology within the business. From this question a number of answers were provided across the interviews, with key concepts correlating through all the answers. Analysing the headlines within table 5.2, the recommendations for overcoming such barriers and issues can be discussed as follows.

UNIQUE PROJECT PARAMETERS / EXISTING BUILDING CONSTRAINTS (HETEROGENEOUS APPROACH)

One of the key barriers that has been identified within the primary data findings and the literature review was heterogeneous nature of construction projects; being that each project can be vastly different from the last and therefore making transfer of technology use and benefit across multiple projects difficult to control. This is a prevalent issue that the industry faces generally.

The heterogeneous nature of projects and the variance seen between multiple projects is typically a difficult factor for contractors to control or mitigate. Whilst many factors of a construction project can be managed or planned, the physical constraints of a project and the parameters on which a project is delivered are defined by its very nature, and so it can be impossible for contractors to determine or control these projects constraints, which can impose constraints on the technology adoption and implementation process. Where contractors can control such a constraint or barrier is within the methodology of such projects. Where technological benefits can be relevant to the physical parameters of a project (such as off-site manufacturing, automations, or design technologies), the heterogeneous nature prevents successful adoption and implementation across multiple projects. However, where technologies advantages are prevalent to such project principles, such as management techniques, or control measures and non-physical benefits, these such technologies could be focused for retail projects, as the benefits can be transferred across multiple projects, partially negating the barriers of the heterogeneous effect.

COST CONSTRAINTS

One of the key barriers that is faced with any technology adoption process, is the cost investment and spend required to implement a new or advancing technology. The cost is typically a risk on any adoption trial that is known to not always pay off. An unsuccessful technology adoption can result in a significant spend from contractors with little or no benefit should the adoption process fail. This risk is something that not all contractors can easily afford, due to the tight constraints imposed on projects and contractors within the construction industry and even more so within the UK Retail sector (Bakery et al., 2014)

For contractors to ensure the cost of a technology is outweighed by its benefits, the initial business case must be considered and reviewed against the entire lifecycle of such technology. The initial investment should be reviewed against the return on investment to understand its tangible advantages (IE. Will it directly save money on any future project? Could it reduce time or resource required?). Once these benefits are understood, the overall attitude towards the investment can be considered, as it can be portrayed as a benefit to those implementing the technology both operationally and commercially. Contractors should ensure that this business case for each technology adoption is fully understood and analysed for cost outlay against benefit, prior to any technology adoption process beginning. The findings and forecast of benefit against a business case should be conveyed to the individuals involved in the technology adoption process – this should then see a greater success rate in technology adoption.

Client Influence or Constraints

In order for contractors to effectively utilise new and advancing technologies, there is a need for clients to understand and align with the technology adoption drive. Contractors can do this in a number of ways, but primarily it is for contractors to push these changes if they want to see change in culture. They can do this by promoting such technologies with clients, to actively show the benefits that can be achieved in utilising technologies, sometimes requiring an upfront commitment of cost or time input to ensure the successful adoption. This commitment and risk can be shared between the client and contractor where practicable, but in many instances, this needs one party to take the lead. This may require contractors to provide case studies or look to provide the initial assessment, sometimes at their own investment (of time and cost) to allow clients to see tangible benefits of such time, quality, cost improvements. One other way to promote such changes and promote the technology adoption with clients is to focus the strategies on general construction advances that are seen within other sectors as examples. It is understood that when contractors can demonstrate value of investment, through case study or evidence gathered, the shift of promoting innovations can see greater incentive and contractors can see greater technology adoption when backed by client demands or influence.

Fast Timescales

One of the key aspects of the UK Retail Construction sector is the faced paced nature of the projects. Where contractors can provide a solution to this barrier is by clearly identifying and allowing for a suitable programme for technology adoption. It is here where contractors can look to implement the Technology Adoption Model (TAM) as a conceptual framework to understand the specific requirements necessary for each technology implementation. The process diagram as shown as figure 2.5 can be utilised as a model with timelines against each step in the process being thought out and planned against the business case requirements. By first understanding the business requirements along with the barriers and the processes, with each step requiring the relevant blockers to be overcome, contractors can map out a target timeline for the technology adoption process. At this point, contractors can then further analyse whether each technology (specific to a project or wider business requirement) can follow the process and be implimented within the time constraints. This understanding of timelines may identify where certain technologies or aspirations may be unachievable for project specifics or business cases, or alternatively it can identify where focus may be required for technologies to be adopted over multiple projects and so further consideration of multiple constraints and barriers must be understood to increase successful technology adoption.

Cultural Bias against new Technology / Experience Influenced Reluctancy

Another barrier that has been identified in the research findings is the cultural bias against new technologies and the bias based on bad experiences of past failed technology adoptions. Interviewee F discussed recommendations of research and due diligence, but focused on the technology itself and the company which has produced and sold it. They stated that many technology companies will sell the idea of a technology solving a business issue, but once the technology has been committed it can typically fall short. They highlighted that "*case studies are important, you know, even lessons learned where people are doing it right or people are doing it wrong as well. Or does it work for them and not for us or vice versa? Does it work for us and not for them? So, there's lots of different things to consider*." This overselling of technologies benefits is something that adds to the negative opinion of new technologies and promotes the reluctancy of adopting new technologies.

The recommendation to overcome the bias and reluctancy seen within the UK Retail Construction sector is for contractors to produce, identify and review case studies or trials of the specific technology, working in real-world situations, to establish a certainty that this technology can solve the business requirement. The results of such case studies and the analysis of the findings against the business case, could then be shared with the end users of the proposed new technology. This will provide insight into the key issues and requirements for the

technology to overcome and the evidence gathered to prove this technology can provide a solution to influence the outcome of the technology adoption process. By including the end-users in the findings and review of the technology, contractors can aim to resolve the 'perceived usefulness' and 'perceived ease of use' factors of the TAM model, aiding in the successful technology adoption process and overcoming any bias or reluctancy shown by the potential end users.

CONSIDERATIONS AGAINST PROJECT SUCCESS

The main focus of technology adoption is for the technology to be implimented to resolve a business or project issue, in aid of overall success. Interviewee B discussed that contractors should consider business case for the technology before looking to implement the adoption. Understanding the problem, they are trying to solve with the new technology adoption, so that they can understand and establish the success measurables. They also advised the use of pilot tests or case studies to fully understand the technologies benefits and weaknesses prior to committing to it, stating that; *"Doing the upfront work and then implementing technology that's actually gonna improve your business".* They then mentioned that prior to any technology adoption completion, the value of the technology must be established to the business to realise the return on investment, again referring back to the original business case. Interviewee D corroborated this, stating that "*there has to be a problem there in the first place. What is the problem statement? What's not working?".* They continued to discuss that the business case must be considered and robust prior to starting any adoption process, to mitigate the potential for failure.

The way in which contractors can overcome any issues in perception, when reviewing the technology adoption through the lens of the TAM model, is to engage with any end users or decision makers that can influence the successfulness of the technology adoption process and communicate the business case and potential business or project problem that can be overcome with the use of this technology adoption. By engaging with decision makers and end users, contractors can influence the decisions and perceptions to promote the technology adoption and increase the rate of success.

LACK OF UNDERSTANDING / TRAINING

The lack of understanding or training on a technology can be seen to influence the outcome to technology adoption. This consideration falls into the TAM conceptual model, looking at the user's perception on the technology and their attitude towards it. Similarly to the bias, the lack of knowledge or training can result in end users being reluctant to adopt new technology as their perception of the technology is not understood to be easy to use or whether the technology can be considered useful. By training the end users, contractors can directly influence the stages of the TAM model and increase the user's perception of the technology, in turn improving their attitude towards using it.

This identifies that contractors can influence the successfulness of technology adoption by overcoming the lack of understanding and training. As identified previously, contractors and business can engage with stakeholders to promote that the technology adoption is perceived well. This engagement is a critical aspect in contractors overcoming many of the barriers such as the lack of understanding and the perception of technology, to ensure successful technology adoption.

In summary, the TAM conceptual model can be utilised in the industry and contractors can use this tool as an aid to increase successful technology adoption. However, as has been identified previously, the TAM model does not account for all aspects of the technology adoption process and so contractors must consider the specific barriers that are preventing successful technology adoption and must understand how to overcome these barriers in order to increase technology adoption. The recommendations set out against each barrier could be used to increase technology adoption for contractors within the UK Retail Construction sector.

6.6.3. RECOMMENDATIONS TO POLICY

The issues that current and previous policies have relating to technology adoption have been discussed previously in this thesis. Whilst policies can be influential to improving technology adoption and can see a drive towards more technology implementation in the industry, the shortfalls on policies to consider the specific barriers preventing successful technology adoption, especially when considering the UK Retail Construction sector, are not fully aligned with the reality of the issues that this research has identified.

Using the findings of this research, the survey questionnaire asked the respondents whether they would be willing to implement technologies in the future. The survey posed to the respondents, asking as to whether they would implement new technologies in a new project and if not, to elaborate on they answer with justification. From the results, 97% of the respondents answered 'Yes', that they would implement a new technology in new projects in the future. However, of the sample group, 3% of respondents answered that they would not implement technology on future projects. From this, the answers that were given as justification were identified were specific barriers that have been discussed previously in this thesis through the literature review and the research findings;

- The aspects of 'Cost' were discussed with the response; "*Budget won't allow for technology / Dependant on costs*".

- The barrier of 'Time' was stated, simply responding that the respondent believed; "*Timescales do not suit*".

- The barrier of experience, culture and perception was mentioned, with respondents stating they have "*No previous experience of knowhow on implementation of technology*" and that the decision would be "*Subject to relevant qualifications and experience of individuals responsible for implementation*".

From the barriers and success factors that have been identified throughout the primary data findings, there is a need to understand how such barriers and issues can be overcome, to increase successful technology adoption within the sector and allow for new policies to be implimented effectively. It can be seen from the survey results, that the respondents would promote technology adoption going forward.

Elaborating on their rationale as to why they would implement new technology on future projects, the responses outlined that they believed "*it can bring real benefit, but all stakeholder groups need to buy into it*" and "*could potentially solve issues before starting on site*". The responses outlined the benefits of new technology being effectively implemented on projects, with one response discussing that the upfront exposure or training is a vital aspect in the process, stating that "*I believe that if done well, then they can be a huge benefit. I also believe that we need to be progressive in our use of technology therefore the more exposure to it we have and the more users of technology, the more refined they will become*".

From the findings of this research, it is believed that future policies can be influenced by taking into consideration both the identified barriers and benefits of technology adoption. Governments and policy makers could consider the factors that are preventing the technology adoption and therefore, new policies could promote the need for change by utilising public information conducted by government funded research. By doing this policy makers could enforce changes within both contractor and client behaviours, without the cost uncertainty or risk being imposed. Also by challenging the client typical behaviours and showcasing the benefits of technology adoption within projects, policy makers can drive a focus for technology implementation, which can in turn, drive a culture change, as they begin to see the benefit for investments. If policy makers were to consider funding case studies and reviewing time lines for policy change, it is believed they could increase technology adoption within UK Retail Construction.

6.7. CONTRIBUTION TO KNOWLEDGE

As identified within the introduction chapter, there is an identified gap in the current field of literature, relevant to the technology adoption within the UK Retail Construction sector. This gap in literature has been identified from the literature review and specifically pertains to the relevance of literature specific to this chosen sector. The retail construction sector has significant constraints on contractors and the projects they undertake, making it volatile and ruthless sector for contractors to engage within. As outlined within this research, the aggressive nature of the retail sector make it a prevalent topic for discussion and research as it can be argued that should a contractor find solutions to work in such a competitive and difficult environment, then the benefits can be transferred across the industry to see benefits. Albeit when reviewed if benefits can be transferred from other sectors into the UK Retail sector, this was not typically viable.

It Is in this specific nature of the UK Retail Construction industry and the specific findings relevant to this sector where this research looks to make a contribution to the existing knowledge. As discussed previously, by analysing the technology adoption within this specific sector, this research looks to build upon any previous literature to provide new information to the field of knowledge. From the research findings, it can be deduced that the contribution to knowledge has been gathered and the findings regarding the technology adoption within the UK Retail Sector and the barriers and key success factors have built upon existing knowledge to provide an original conclusion. Where this research has also contributed to knowledge is by analysing the findings through the lens of the Technology Acceptance Model. The conceptual model has been utilised to review the data gathered, as part of this research the analysis of future progression of the TAM has been discussed. Assumptions have been made within the research to allow for conclusions to be drawn from the findings. However, where these assumptions and limitations are identified throughout the thesis, there is an opportunity for future research to redefine these conclusions and provide further discussion to provide a more robust understanding within the field of literature.

This research has contributed by providing recommendations to contractors, utilising the TAM framework and the identification of key barriers and success factors derived from the literature review and primary data, to form the basis of solutions and recommendations, to overcome such barriers to aid in successful technology adoption within the sector. It is understood that there is currently no literature that specifically discusses the factors and analysis that this research has provided. It is this discussion and findings that forms the contribution to the knowledge field.

6.8. SUMMARY OF THE CONCLUSION

6.8.1. PERSONAL REFLECTION

From the perspective of the researcher, in reflection of the thesis process, the research has been carried out with the purpose to influence contractors within the industry, through a pragmatism lens. The outcomes of the thesis have provided conclusions to the research aim and objectives and has given recommendations for the industry, but on reflection the researcher acknowledges there are areas of the research that could be improved or carried out differently, if the research was to be undertaken again.

One area of the thesis that could be improved would be areas of focus of the literature review. Whilst the literature review was broadly steered by the limitations in existing research on the retail construction sector, a large section of time and focus was drawn to specific technologies and their specific or potential impact. This focus on specific technologies, whilst informative, did not truly address the research problem. The focus could have stayed more on the specific barriers faced within technology adoption as this was the primary aim of the research. Secondly to this, the section of the literature review should have had more focus and attention on the

barriers or constraints of retail construction as it became the key consideration in the final discussion and conclusions. The time spent reviewing literature on specific technologies, of which only needed high level review, could have potentially been spent more productively on reviews of the retail sector characteristics or construction organisational barriers that transfer from sector to sector to prevent technology adoption.

Another area reflected upon by the researcher is the survey questionnaire production and use. Whilst the survey was a critical factor in defining the research findings and drawing conclusions, the researcher acknowledges that the sample groups were potentially limited and some of the survey questionnaire become irrelevant to the final discussions. As mentioned previously, the focus on specific technologies both in literature review and the survey questions potentially distracted from the main aim of the research and if the research was to carry out the research again, this would be factored into the survey questions and the questions that refer to specific types of technology would have been changed for questions more focused on retail construction barriers. The questions in the survey did highlight the fact that the specific technology was not utilised and therefore influenced the interview discussions, which in part was the purpose of the survey. However, this almost distracted from the focus of the research and in review could have been discussed and concluded from the literature review.

An area of the research that the researcher believes went well was the outcomes from the findings and analysis against the literature review. One of the considerations during the literature review was the focus on general construction in literature, with limit direct consideration for the retail sector. It is this gap in literature that the research aimed at, however there was a potential for the research findings to conclude that the with regards to technology adoption, the retail sector acted no differently to the general industry and this gap in literature was potentially irrelevant as the existing research was transferable. This was not the case, and from the research findings a clear distinction was made from the general industry and the specific characteristics and requirements of the retail sector became a key element in the research. The researcher believes this is a critical consideration of the research aim and it highlights the requirement for future research to continue to explore this specific sector to develop the field of literature.

Focusing on the personal journey through the development of this thesis, the researcher has developed their skill set and knowledge in the field of construction management and technology and found the interview process to be extremely insightful. Working in the lens of pragmatism, the literature review, whilst providing substantial information on the research topic, was not always necessarily grounded in real world situations that the researcher could see working in the industry. The interviews therefore gave an insight, from experts in the field and either corroborated the literature review findings or in part dismissed them. It was this process that the researcher found most insightful through the process of developing this thesis.

In reflection to the overall thesis, the researcher believes that the research carried out has highlighted a specific gap in the field of literature which can be key to the overall industry progression and as such believes the research on the whole was successful. The focus of research and the development of the research gathering could have been improved to more closely focus the findings on the main objectives, but the findings provided sufficient information to generate a positive discussion and draw conclusions that will hopefully influence future works.

6.8.2. THESIS ASSUMPTIONS AND LIMITATIONS

As part of the review of the thesis, there are identified limitations in the research. These have been highlighted through the thesis where relevant. As part of the methodology chapter, the assumptions, limitations and ethics has been discussed in detail. From this, the main limitations in the findings have been reviewed. The limitations of the sample groups and the reach of the respondents was discussed, with the sample group, being limited in reach to social connections with the researcher.

Some of the limitations from the findings are identified as the gap in the current research field. As highlighted in the literature review, the research on technology adoption in construction is predominantly associated with general construction or 'big build' construction projects and organisations. The key considerations of the specific retail sector and the characteristics within this sector are therefore not typically discussed in the literature, resulting in the findings not being directly transferable to the retail sector. This resulted in assumptions being made through the literature review, to accommodate the lack of specific research into this sector.

The limitations in sample groups for the primary research primarily comes from the limitations in reach of the sample group. Due to the methods of issuing the survey questionnaire, it can be said that the reach of sample group was limited to professionals in a similar industry circle to the researcher. Whilst this can be considered to limit the findings and conclusions, it allowed the researcher to understand and control the sample groups for both the survey and interviews, ensuring that the responses were relevant to the subject field and the chances for misinterpretation was limited.

Other limitations through the research development was the constraints imposed from the Covid-19 pandemic. Due to the severity of the pandemic, the government-imposed restrictions on social interaction between people, which resulted in businesses closing for a duration in 2020. This disruption through businesses and industries resulted in delays in issuing the survey and carrying out the interviews. It is also believed that as the survey was carried out in 2020, the restrictions may have resulted in a lesser return rate, then if this was carried out during usual times with no restrictions.

Another impact from the Covid-pandemic is the limitation in R&D and technology adoption within the last few years, as a result of the pandemic and its impact on both economic and organisational activities (ONS, 2021; Pierri and Timmer, 2020). The uncertainty of the pandemic and its restrictions on businesses resulted in organisations being more reluctant to invest in R&D, including new technology adoptions. As this was the focal point of this thesis, this impact and disruption in the field had a subsequent impact in both the findings from the industry and the literature, which in turn may limit or impact the overall conclusions. As the Covid-19 pandemic has been ongoing since 2020, the overall impact and disruption on the findings is unclear, without taking into consideration future research with looks to address this impact on the technology adoption.

6.8.3. DIRECTION FOR FUTURE RESEARCH

From this thesis, the progression of literature and research has an opportunity to be developed and progressed further. The continuation of research is a key factor to progress the field of literature and influence the industry progression. The areas of future research that this thesis has identified are as follows;

- Analysis of the research findings through development of alternative theoretical frameworks, including development of a new theoretical framework, if necessary.

- Analysis of direct impact of increased technology adoption, on real-world productivity specifically within the UK Retail Construction Sector.

- Review of technology adoption barriers within Retail Construction, specific to independent regions within the UK.

ANALYSIS OF THE RESEARCH FINDINGS THROUGH DEVELOPMENT OF ALTERNATIVE THEORETICAL FRAMEWORKS

One of the areas where future research can be progressed and built upon from this thesis is the use of the TAM model, which as identified previously, has its limitations. To fill the identified gap within the field of literature, this research reviewed the findings through the lens of the original

TAM model (Davis, 1986). However, since its early creation there has been development on this model to include more factors that can impact the success of technology adoption.

Although it has been identified that the TAM model can be utilised within the UK retail construction sector as a theoretical model to follow for organisations, this research has also discussed the limitations on this model when it comes to the specific constraint factors within the UK retail sector. The TAM model has been discussed in the wider construction industry many times within the field of literature (Younghwa et al., 2003; Park and Park, 2020). However, the identified constraints of the retail sector being significant and specific to the sector, the consideration within the original TAM model, being 'External Factors' does not provide a detailed approach for organisations to transfer the model specifically to the retail sector, if looking to identify more specific key barriers or factors within the model. This discussion was identified within the interview responses with Interviewee D stating, when discussing the technology adoption process, that "*It has to be scalable, has to be transferable, it has to work in a [retail sector] environment".* It is this element of the TAM model where the retail sector organisations would need to look to develop to consider the cultural and specific environmental constraints as identified throughout this thesis. It is this specific area where future research can look to build upon the conclusions in this thesis, looking to review the findings through an alternative theoretical frameworks.

Analysis of direct impact of increased technology adoption, on real-world productivity specifically within the UK Retail Construction Sector

The discussions within this thesis have built upon the existing literature in the field of technology adoption within the construction industry. The gap in the existing literature have focused towards the specific area of success factors and barriers of technology adoption within UK retail construction and the constraints that organisations and projects working within the sector face. Discussions were then developed in the lens of the TAM model and recommendations were provided for organisations within the industry on this basis. Future research is advised to progress the discussions in this thesis, specifically focusing on the areas identified as limitations or where the need for further development and research is required. The discussion topic is a key area within the industry and the use of findings within this thesis along with future research can potentially drive the progression of technology adoption to increase productivity in the UK retail construction sector.

Review of technology adoption barriers within Retail Construction, specific to independent regions within the UK.

Further to this, there could be an opportunity for future literature to carry out a similar research, with similar aims and objectives through the TAM lens, but targeting specific or other regions within the UK, specifying single or multiple regions to compare results against the findings of this thesis. This could then be used with this research to build upon the field of literature to analyse the issues and provide further solutions to the industry, if different from the conclusions and recommendations in this thesis.

7.0 LIST OF FIGURES

8.0 LIST OF TABLES

9.0 REFERENCES

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10.0 APPENDICES

10.1. APPENDIX A

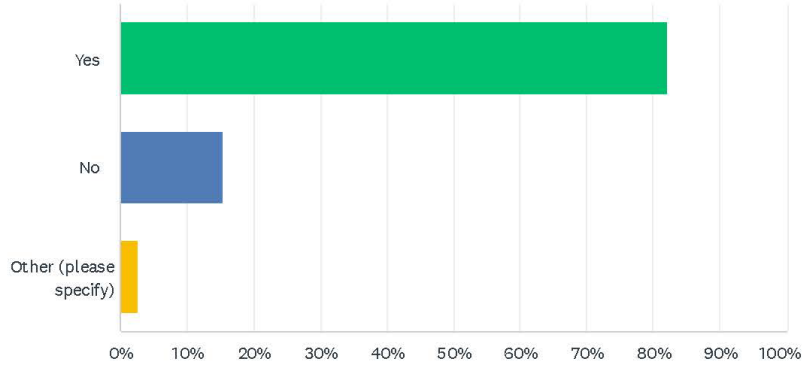
SURVEY RESULTS

The Applications Of Advanced Technologies In UK Retail and Fit-Out Construction Projects And Their Real-World Effects On Productivity in Project Delivery

SurveyMonkey

Q1 Do you Currently Work within the Retail and Fit-out Sectors of the UK construction Industry?

Answered: 39 Skipped: 1

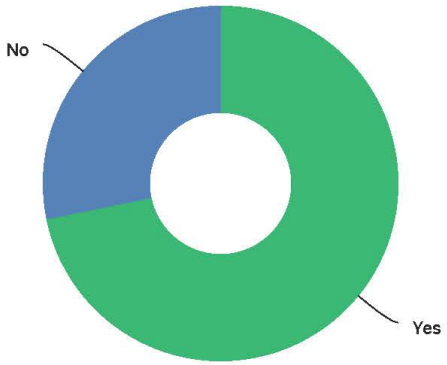


ANSWER CHOICES	RESPONSES	
Yes	82.05%	32
No	15.38%	6
Other (please specify)	2.56%	1
TOTAL		39

#	OTHER (PLEASE SPECIFY)	DATE
1	I did,now consultant to architectural practice	7/8/2020 8:53 AM

Q2 Have you been involved in the review or assessment of a project, whereby factors on the success or failure have been considered? (IE lessons learnt)

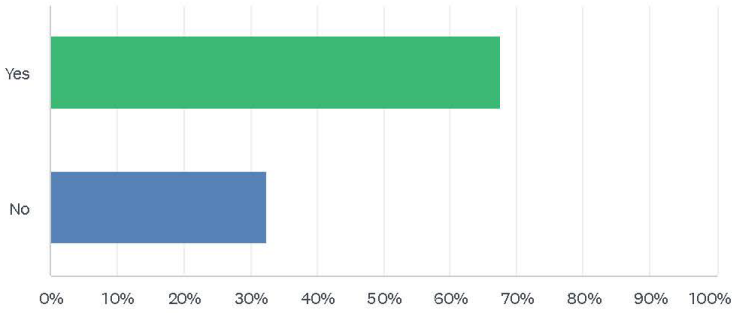
Answered: 39 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	71.79%	28
No	28.21%	11
TOTAL		39

Q3 In your role, do you have any influence in specifying or choosing technologies or methodologies in construction projects you work on?

Answered: 40 Skipped: 0



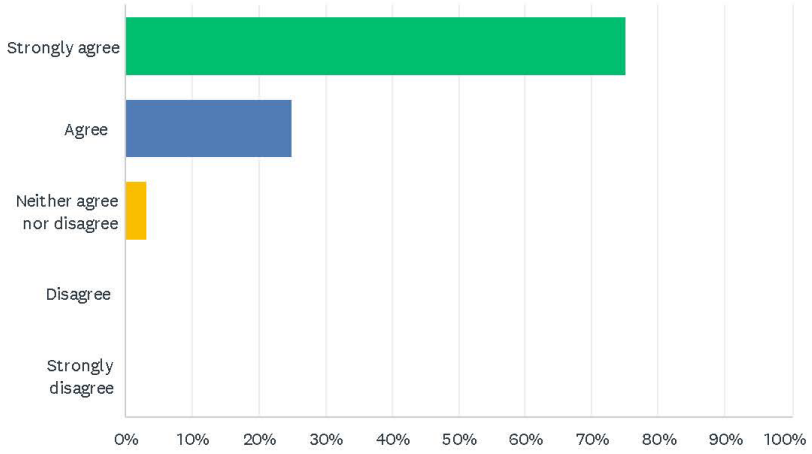
ANSWER CHOICES	RESPONSES	
Yes	67.50%	27
No	32.50%	13
TOTAL		40

Q4 Productivity on site is a critical factor in the overall success of a project?

Answered: 32 Skipped: 8

The Applications Of Advanced Technologies In UK Retail and Fit-Out Construction Projects And Their Real-World Effects On Productivity in

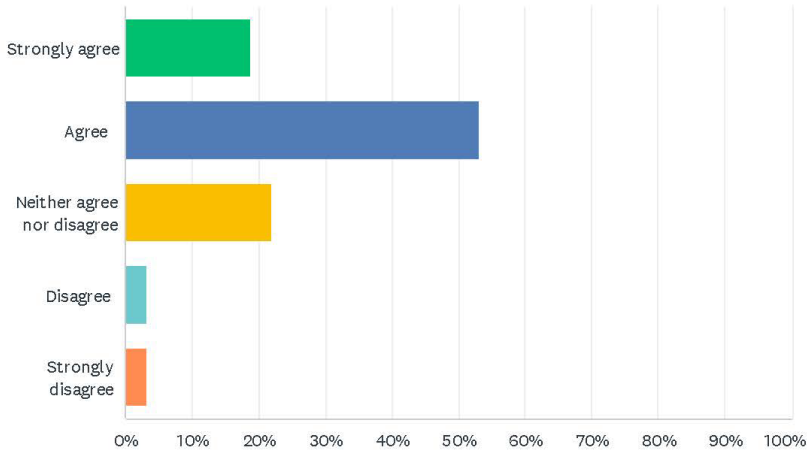
SurveyMonkey



ANSWER CHOICES	RESPONSES	
Strongly agree	75.00%	24
Agree	25.00%	8
Neither agree nor disagree	3.13%	1
Disagree	0.00%	0
Strongly disagree	0.00%	0
Total Respondents: 32		

Q5 In recent years there has been an increase in the adoption of technology into construction projects.

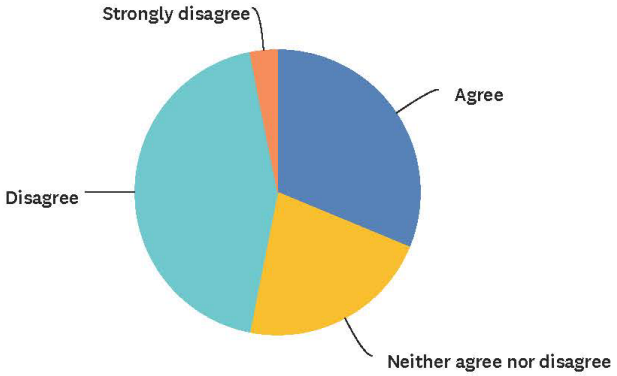
Answered: 32 Skipped: 8



ANSWER CHOICES	RESPONSES	
Strongly agree	18.75%	6
Agree	53.13%	17
Neither agree nor disagree	21.88%	7
Disagree	3.13%	1
Strongly disagree	3.13%	1
TOTAL		32

Q6 The implementation of technology into construction projects has been transferred into all sectors of the construction industry equally? (Large Scale Construction vs. House Building vs. Retail vs. Fit-Out)

Answered: 32 Skipped: 8



ANSWER CHOICES	RESPONSES	
Strongly agree	0.00%	0
Agree	31.25%	10
Neither agree nor disagree	21.88%	7
Disagree	43.75%	14
Strongly disagree	3.13%	1
TOTAL		32

#	OTHER (PLEASE SPECIFY)	DATE
1	I don't have experience in all sectors to comment.	7/8/2020 7:15 AM

Q7 Studies show that refurbishment of existing buildings such as in Retail & Fit-Out sectors have not adopted technologies as efficiently as new build or high rise development. Why do you believe Technology has

not be utilised as effectively within the Retail and Fit-out, when compared to other sectors and industries?

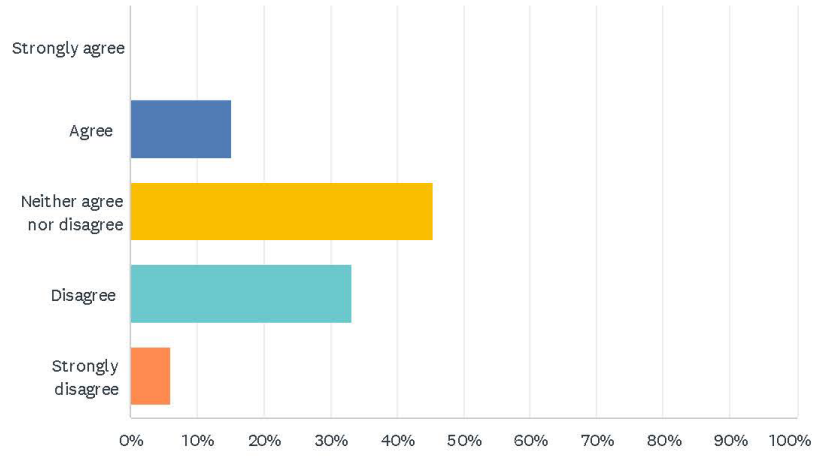
Answered: 29 Skipped: 11

#	RESPONSES	DATE
1	The design difficulties of fit-out tend to be minor in comparison to high rise, new builds, especially since fit-out can be compared with other projects whereas new builds are unique.	8/7/2020 1:37 PM
2	Older buildings with existing technology do not lend them selves to updating without incurring significant cost, not budgeted for.	7/17/2020 10:10 AM
3	Due to the fact you are in existing buildings sometimes over 100 years old with very little as built information.	7/15/2020 10:19 AM
4	Projects generally smaller and size and some technologies are initially, at least, seen as expensive.	7/14/2020 10:20 AM
5	Generally very short time frames, which reduces the need of technology.	7/11/2020 12:19 PM
6	I think that the fast paced nature of the refurbishment and fit out industry does not lend itself to having the time required to adapt and learn. I think there isn't the money in projects to invest into the technology. I also don't think the potential benefit will be tangible on said refurb or fit out projects.	7/10/2020 2:55 PM
7	Generally smaller scale developments with variety of pre-existing technologies and procedures to take into account	7/10/2020 2:44 PM
8	I think smaller retail type projects are seen as less 'sexy' and are often driven down to a super aggressive price point so innovation and investment in technology is limited.	7/9/2020 9:03 PM
9	Cost is a factor, and can be absorbed easier on larger projects	7/9/2020 8:22 PM
10	I believe its due to the scale of the project, the complex nature of existing buildings, its easier for people to revert back to what they have always done rather than embracing new technology which would improve productivity.	7/9/2020 8:52 AM
11	We believe its easier to implement better technolgy and less labour intensive route on new build.	7/8/2020 8:35 PM
12	time is such a critical factor, particularly within fast track jobs with a short duration. I feel people like to stick to tried and tested methods	7/8/2020 1:46 PM
13	It is generally not cost effective. The Retail sector is quite tight budget wise and does not offer much movement for this opportunity.	7/8/2020 12:13 PM
14	From experience a lot of the tools that exist are not initially geared toward existing buildings, and operate more efficiently in a new build setting.	7/8/2020 10:20 AM
15	I believe that it has, in our refurb world we utilise point cloud surveys to assist with dimension checks, design, clash detection etc.	7/8/2020 9:48 AM
16	Difference in perceived / actual efficiences from adopted technologies on large scale/repeatable and new builds compared to more bespoke nature of fit out	7/8/2020 9:45 AM
17	The industry is very slow to react to change	7/8/2020 9:01 AM
18	Drwg systems such as Revit are more readily used on newbuild.	7/8/2020 8:56 AM
19	Each project is unique and therefore technologies which can be used in new build or high rise development might need to be tailored more to the specific refurbishment project which could make them a more expensive method.	7/8/2020 8:54 AM
20	My experience in the UK retail and fit-out industry is too limited to comment at this stage.	7/8/2020 7:15 AM
21	Clients are averse to spending either time or money in this investment when the fit-out has only a limited life-time, particularly in existing buildings which are substantial obstacles to "clean" design which can readily adopt new technologies.	7/7/2020 9:50 PM
22	Very competitive market and some technologies have an initial cost that clients may not want to add to the project cost. This may only be a perception that it adds cost to the project as there are often later savings due to efficiency, but this is not easily measurable.	7/7/2020 7:35 PM

	Often the programme start dates (lead in duration) do not provide the time required to utilise some technologies which require a larger mobilisation period to benefit the project in the long run.	
23	New technology is slow to implement into certain sectors as the "way of working" / culture is difficult to change	7/7/2020 5:01 PM
24	Differing opinions of what to use/how to use. The construction industry is still on many occasions further behind the curve and change takes time	7/7/2020 3:51 PM
25	Multiple reason: In accurate building information External factors Parameters are not same in every projects Old leadership team (Don't know much about technology) Politics Lack of funding	7/7/2020 3:08 PM
26	.	7/7/2020 3:00 PM
27	Time constraints	7/7/2020 2:35 PM
28	High capital expenditure; Complexity of systems; Insufficient awareness of the benefits of new technologies e.g. OpEx savings;	7/7/2020 1:49 PM
29	end user cost, time poor for implementation	7/7/2020 1:09 PM

Q8 The UK Retail and Fit-Out sectors utilise technology as effectively as other sectors in UK Construction.

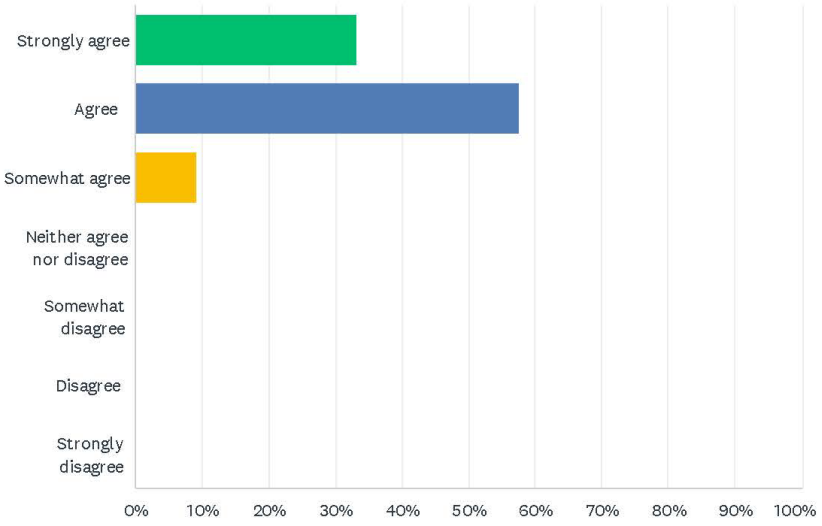
Answered: 33 Skipped: 7



ANSWER CHOICES	RESPONSES	
Strongly agree	0.00%	0
Agree	15.15%	5
Neither agree nor disagree	45.45%	15
Disagree	33.33%	11
Strongly disagree	6.06%	2
TOTAL		33

Q9 You believe technology can directly help better the productivity, delivery and success of a project if it is used correctly.

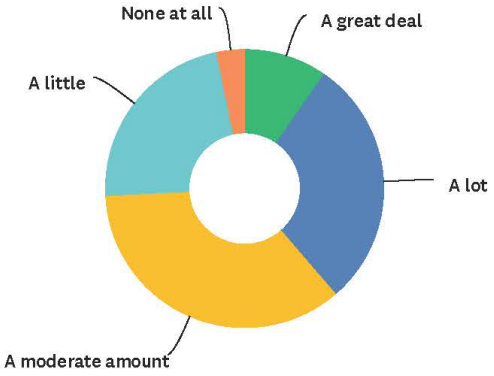
Answered: 33 Skipped: 7



ANSWER CHOICES	RESPONSES	
Strongly agree	33.33%	11
Agree	57.58%	19
Somewhat agree	9.09%	3
Neither agree nor disagree	0.00%	0
Somewhat disagree	0.00%	0
Disagree	0.00%	0
Strongly disagree	0.00%	0
TOTAL		33

Q10 You have directly seen the use of technology have a benefit on the overall success of a project you have worked on.

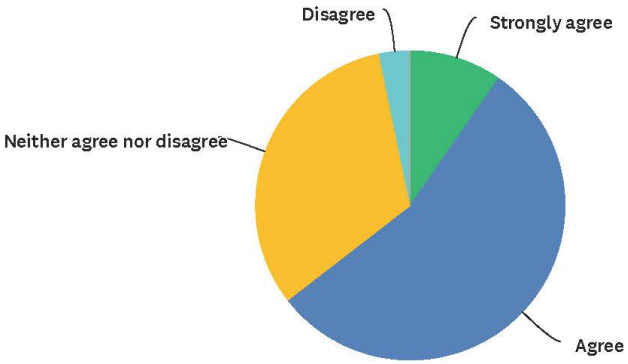
Answered: 31 Skipped: 9



ANSWER CHOICES	RESPONSES	
A great deal	9.68%	3
A lot	29.03%	9
A moderate amount	35.48%	11
A little	22.58%	7
None at all	3.23%	1
TOTAL		31

Q11 You have directly seen a benefit of technology contribute to productivity on site.

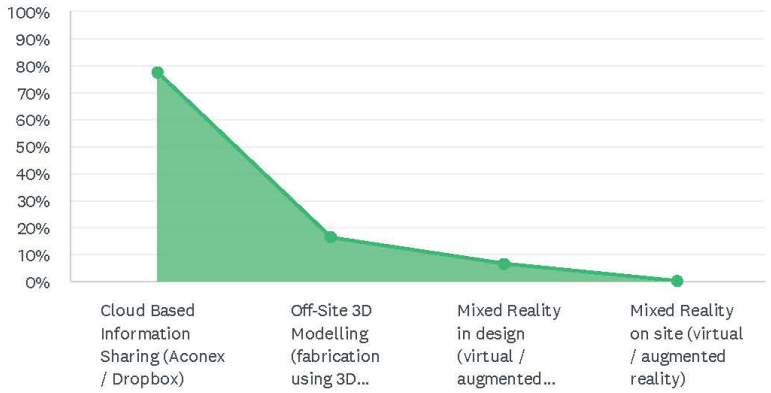
Answered: 31 Skipped: 9



ANSWER CHOICES	RESPONSES	
Strongly agree	9.68%	3
Agree	54.84%	17
Neither agree nor disagree	32.26%	10
Disagree	3.23%	1
Strongly disagree	0.00%	0
TOTAL		31

Q12 You have worked on a project that has utilised the following technologies

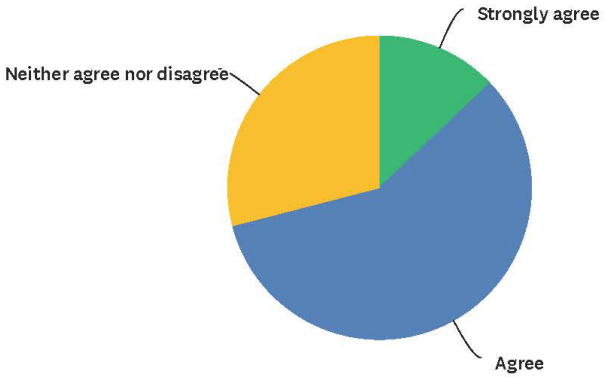
Answered: 31 Skipped: 9



ANSWER CHOICES	RESPONSES	
Cloud Based Information Sharing (Aconex / Dropbox)	77.42%	24
Off-Site 3D Modelling (fabrication using 3D printing)	16.13%	5
Mixed Reality in design (virtual / augmented reality)	6.45%	2
Mixed Reality on site (virtual / augmented reality)	0.00%	0
TOTAL		31

Q13 The use of technology has directly benefited productivity on site.

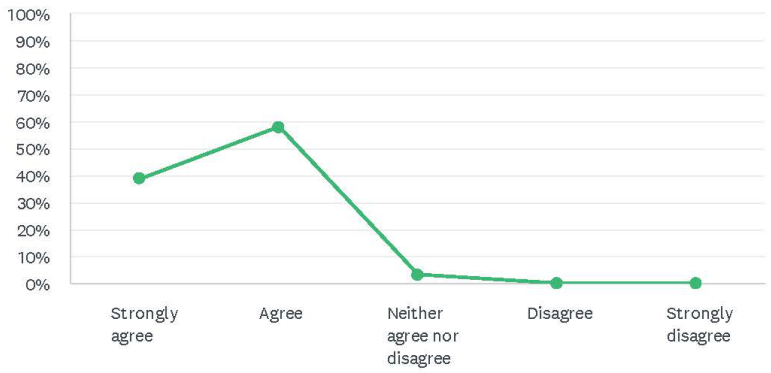
Answered: 31 Skipped: 9



ANSWER CHOICES	RESPONSES	
Strongly agree	12.90%	4
Agree	58.06%	18
Neither agree nor disagree	29.03%	9
Disagree	0.00%	0
Strongly disagree	0.00%	0
TOTAL		31

Q14 The use of technology will benefit the retail and fit-out sectors in years to come, and as such technology develops, the delivery of projects will become more productive as a result.

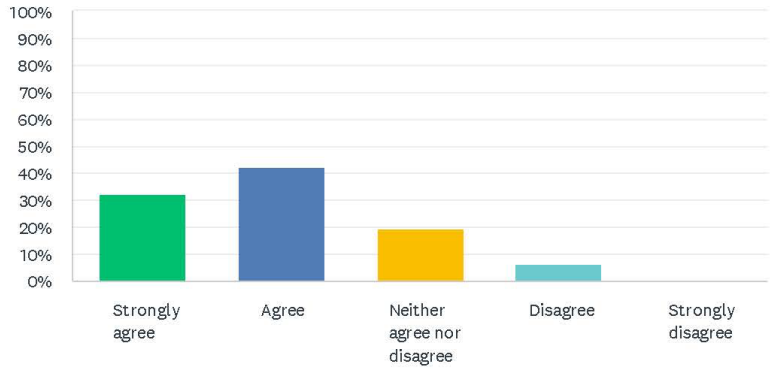
Answered: 31 Skipped: 9



ANSWER CHOICES	RESPONSES	
Strongly agree	38.71%	12
Agree	58.06%	18
Neither agree nor disagree	3.23%	1
Disagree	0.00%	0
Strongly disagree	0.00%	0
TOTAL		31

Q15 The benefits of using cloud based information sharing on a project outweigh any costs for such technology.

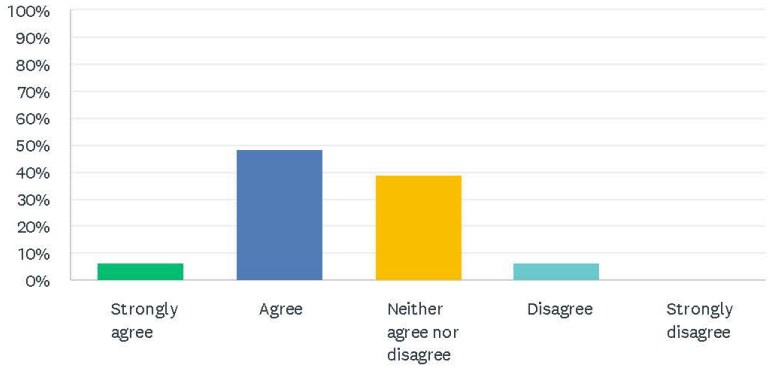
Answered: 31 Skipped: 9



ANSWER CHOICES	RESPONSES	
Strongly agree	32.26%	10
Agree	41.94%	13
Neither agree nor disagree	19.35%	6
Disagree	6.45%	2
Strongly disagree	0.00%	0
TOTAL		31

Q16 The benefits of using off-site 3d modelling production on a project outweigh any costs for such technology.

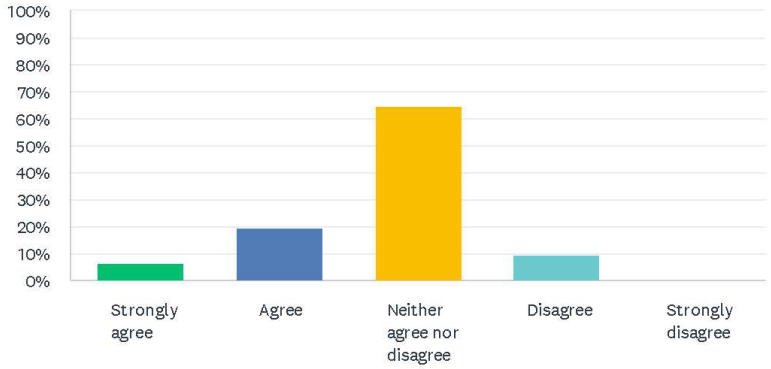
Answered: 31 Skipped: 9



ANSWER CHOICES	RESPONSES	
Strongly agree	6.45%	2
Agree	48.39%	15
Neither agree nor disagree	38.71%	12
Disagree	6.45%	2
Strongly disagree	0.00%	0
Total Respondents: 31		

Q17 The benefits of using augmented reality on site on a project outweigh any costs for such technology.

Answered: 31 Skipped: 9



ANSWER CHOICES	RESPONSES	
Strongly agree	6.45%	2
Agree	19.35%	6
Neither agree nor disagree	64.52%	20
Disagree	9.68%	3
Strongly disagree	0.00%	0
Total Respondents: 31		

Q18 If you were setting up a new refurbishment project within the constraints of an existing building, would you implement the application of new technologies as mentioned previously?If no, what would deter you from utilising such technologies?

Answered: 31 Skipped: 9

ANSWER CHOICES	RESPONSES	
Yes / NO?	96.77%	30
Reason?	77.42%	24

#	YES / NO?	DATE
1	yes	8/7/2020 1:40 PM
2	No	7/17/2020 10:12 AM
3	No	7/15/2020 10:23 AM
4	YES	7/14/2020 10:22 AM
5	Yes	7/11/2020 12:29 PM
6	No	7/10/2020 2:57 PM
7	Yes	7/10/2020 2:47 PM
8	Yes	7/9/2020 9:07 PM
9	Yes	7/9/2020 8:25 PM
10	No	7/9/2020 8:56 AM
11	Yes	7/8/2020 10:17 PM
12	Yes	7/8/2020 8:40 PM
13	yes	7/8/2020 1:48 PM
14	Maybe	7/8/2020 12:16 PM
15	Yes	7/8/2020 10:23 AM
16	point cloud survey	7/8/2020 9:50 AM
17	Very much dependent	7/8/2020 9:47 AM
18	Yes	7/8/2020 9:31 AM
19	No	7/8/2020 9:03 AM
20	Yes	7/8/2020 8:56 AM
21	Yes	7/8/2020 7:20 AM
22	Yes	7/7/2020 9:54 PM
23	Yes	7/7/2020 7:39 PM
24	Yes	7/7/2020 5:02 PM
25	Yes	7/7/2020 3:54 PM
26	yes	7/7/2020 3:38 PM
27	Yes	7/7/2020 3:12 PM
28	Yes	7/7/2020 2:37 PM
29	Yes	7/7/2020 1:56 PM

30	yes	7/7/2020 1:11 PM

#	REASON?	DATE
1	Normally budget won't allow for new technologies.	7/17/2020 10:12 AM
2	No previous experience or knowhow on the implemtation of such technology	7/15/2020 10:23 AM
3	If this is not embraced then, it cannot be critical analyse to see if there is any benefits to be gained. With a very progressive industry it could be a game changer.	7/11/2020 12:29 PM
4	The timescales required. The investment required. The learning time required.	7/10/2020 2:57 PM
5	Subject to adequatley assessing the relevant qualifications and experience of the individuals responsible for the implementation	7/10/2020 2:47 PM
6	I feel it can bring real benefit but all stakeholder groups need to buy into it.	7/9/2020 9:07 PM
7	to help de-risk the project	7/9/2020 8:25 PM
8	because it would be lenghtly to implement, however if the techology was eaiser to use and more accessiable it would help the overall progress and could potentially solve issues before starting on site.	7/9/2020 8:56 AM
9	The establishment of detail and coordination prior to getting on site produces real waste reduction in time , material and improves quality	7/8/2020 10:17 PM
10	Experience is key in progressing technolgies regardless of new or existing.	7/8/2020 8:40 PM
11	i have seen the benefits	7/8/2020 1:48 PM
12	It is dependant upon cost and if the Client is wiiling to pay up front for these works to be carried out.	7/8/2020 12:16 PM
13	I believe that if done well, then they can be a huge benefit. I also believe that we need to be progressive in our use of technology therefore the more exposure to it we have and the more users of technology, the more refined they will become.	7/8/2020 10:23 AM
14	accurate dimensions, assists with design stage	7/8/2020 9:50 AM
15	Depends on scale, budget, and relevant application adding sufficient value	7/8/2020 9:47 AM
16	I feel that there will be reluctance amongst site staff to embrace the technology and use it effectively	7/8/2020 9:03 AM
17	Efficiency	7/8/2020 8:58 AM
18	Information sharing would be used, and to some extent virtual reality but only so the client fully understands the work in order that they make fewer changes	7/8/2020 8:56 AM
19	One can only benefit from the use of new technologies that assit with obtaining very accurate existing information, for example a 3D scan of an existing space rather than an old school site survey.	7/8/2020 7:20 AM
20	Sufficient time and budget will trump Dropbox every time and projects can be readily understood with simple printed drawings BUT technology is immediate and democratic and its use will become better.	7/7/2020 9:54 PM
21	BIM / 3d model to look at design and iron out errors when constructing on site	7/7/2020 5:02 PM
22	to aid productivity	7/7/2020 3:38 PM
23	Provided the project budget permits.	7/7/2020 1:56 PM
24	precision, visablity, quality, maintenance	7/7/2020 1:11 PM

10.2. APPENDIX B

INTERVIEW PROMPT QUESTIONS

Initial Statement

The purpose of this interview is to establish – from knowledge and experience of the interviewee; their view on the implementation of advancing and new technologies in the UK retail construction industry and any reasons contributing to such technologies being implemented affectively or reasons for why technology implementation may be blocked.

The answers given in this interview will be used to develop analysis and correlations between interviewee responses to understand from the professionals that have been interviewed, rationale as to why retail and fit-out sectors fall behind the trend in adoption of technology and thoughts on whether such technologies could be the answer to the productivity issues seen in the UK construction industry. The analysis will be carried out in the lens of and reviewed against the Technology Acceptance Model (TAM) to understand if the TAM model can be further utilised in future research in this field of knowledge, or if a more suitable model may be required.

The analysis and answers will be further utilised within the wider thesis conclusions and where possible will be used to help identify any trend or help give advice to contractors to adopt such technologies in the future.

By agreeing to continue with the interview, the interviewee is accepting that the answers given will be published and reviewed in open format as part of the thesis and can be seen publicly.

Sample Group

Interviewees must be;

- experts in the field of UK retail construction.
- Understand and engage regularly in implementation of technologies within their organisations.
- Be at a senior management level in their organisations and be able to influence implementation of technologies.
- Have experience within the industry of more than 10years.

Interviewees should be;

- Experts in construction technology
- Have experience directly implementing technology within a retail construction organisation.
- Have worked across multiple sectors and multiple organisations.
- Understand the principles of the Technology Acceptance Model (TAM)

MPhil Interview Questions

1. How have you experienced the implementation or adoption of a new technology within your current role? What are the main positives and negatives of the implementation or adoption of a new technology within your current role?

2. What do you believe are the key success factors for technology adoption within businesses?

3. Do you believe there are any specific key factors that relate specifically to Retail UK Construction?

4. In your experience, what are the specific key success factors and barriers that relate a UK retail construction company, when looking to adopt and implement a new or advanced technology through their business?

5. If presented with a new or advanced technology in the future, what methods (communication, training, trailing etc.) would you use to successfully adopt and implement the technology through your business?

6. If you were to give advice to another contractor working in the UK retail construction industry, what 3 tips would you give to them if they were looking to implement a new or advancing technology?

7. Is there anything else you believe is important and would like to discuss on the topic of new technologies adoption within UK retail construction, whether it be information or research papers you recommend, or ongoing relative developments in the industry?

Thank you for your time, it is very much appreciated.

Declaration

I have read the initial statement and interview prompt questions and consent to my interview being recorded along with my responses being used as necessary in the research paper outlined above.

Signed:…….

Interviewee:

Signed:…….

Interviewer: Joseph Elliott

10.3. APPENDIX C

PILOT SURVEY ANALYSIS

TIME / DURATION OF INTERVIEW

The main aim of duration for the interviews was to work roughly within a 30minute timeframe. Whilst the time was not the priority and establishing a continued flowing conversation was a key criteria for the interview aims, the sample group for the interviews are to be senior managers in retail construction companies which could be assumed would busy individuals with not a lot of spare time, so to try to ensure interview response rates were as high as possible, the interview was to be kept concise. It was established a 30minute interview was achievable for most busy working individuals, whereas increasing this time may result in a lower response rate. The chosen approach was to agree a time and date and issue a Microsoft Teams outlook calendar invite, to the participant. This was set at a 30minute duration.

The Pilot interview conducted was a total of 33 minutes 19seconds as identified on the transcript. This included 3minutes 36seconds of social interaction and introductory discussion before the first question was asked. When taking this into consideration, it results in the overall time of the interview when responding to questions and answers, was just under 30minutes. This gave a good indication that the timing of the interview with the number of questions and prompts suits the desired outcome. The initial social discussion is a key aspect in developing a rapport with the interviewee and establishing an approachable and open discussion before the interview questions begun (McGrath, Palmgren et al, 2018). Therefore, this section would be factored into all discussions and the use of the pilot survey would establish a maximum time allowance of 5minutes for each interview.

Whilst the pilot interview did surpass the overall desired duration of 30minutes, a level of flexibility in the interview durations can be applied and it is assumed that whilst some interviews may take the full 30minutes, there may be some that fall short of this time, due to interviewees personal response rates. Therefore, it has been decided that the length of the interview and proposed duration are adequate to continue to the full interview process. As discussed previously, the duration of the interview, whilst important was not the main criteria in developing the interview questions and structure. The review of the duration of the pilot interview resulted in acceptance that the current format and questions, achieving circa 30minutes is sufficient to get detailed responses and complete the interview, so this will be continued through to the full-scale interview process.

DOMINANCE OF THE INTERVIEW

The dominance of an interview can be important when reviewing the responses to understand whether the interviewer or interviewee was leading the general discussion and how much of the conversation needed direction or stimulation from the interviewer. Krouwell, Jolly et al. (2019) discuss the relevance of dominance that it “is a measure of the percentage of the interview that the interviewer is leading, this is a subjective measure but quantifiable none the less”.

The dominance of the interview is important as it can effect the reliability of the data that is collected. As part of the interview process, the interviewer can have an affect on the responses of the interviewee, whether known or otherwise. McGraph, Palmgren et al. (2018) discussed the role of the interviewer and its influence on the data collected when discussing tips for researchers in the interviewing process. They state that “the interviewer needs to be reflexive, conscious, and aware about how his or her role might impact the conversation between the interviewer and interviewee”. The way in which interview questions are not only structured, but the way in which they are presented in the interview can affect the interviewees perception of the question and can sometimes influence the answers given. This needs to be considered in the interview analysis and as such was a key factor in reviewing the pilot survey; to establish if

the interview was led by the interviewer, or if the conversations were developed and directed by the interviewee.

When reviewing the pilot interview the dominance of the discussion can be established simply by reviewing whether the interviewer or interviewee spoke the most and whether this was responsive discussion or leading discussion. However, it can also be reviewed in more depth when reviewing the actual statements and discussion; whether the interviewer used any leading questions or if the interviewee led the discussion and guided the conversation naturally to their responses. This can also be reviewed by looking at the duration of time spoken by each party and understanding which person spoke for the longer duration. This can even be factored into a percentage of discussion to establish a quantifiable analysis of dominance of the discussion.

QUALITY OF ANSWERS

The quality of the answers from the interview is determined by the amount of information provided by the interviewee. This is determined by transcript analysis of the interview. The way in which the quality is reviewed is by looking at the number of statements or codes from a discussion and whether these statements fall within the relevant discussion topic or if a number of them begin to drift outside of the aims of the interview. This can then be reviewed in the lens of the TAM model, by utilising the factors within TAM as relevant topics or statement codes to review correlation or relevant of the responses against the TAM theory. The more prominent statements from a single line of questions could determine that the quality of answer was high. However, this then requires secondary review against each statement as to whether the statements are good quality themselves or irrelevant when looking at the interview questions.

Seidman (2006) states that “at the heart of interviewing research is an interest in others individuals’ stories because they are of worth.” He discusses the rationale of choosing interviewing methods as data collection and the reasoning of this for individual researchers. One of the key aspects he discusses for interview style methods is the individual nature of responses that can be obtained. Whilst this is one of the positive aspect, that can produce a wide spread of data, it can also be difficult to constrain the conversations to specific discussion relevant to the research aims. It is at this point that the interviewer must guide the questions to keep the interview on track. This variance of discussion is key to understanding the quality of the responses from the interviewees as it could make the data analysis more difficult in finding the specific answers that can direct the overall research discussion, if hidden in a larger interview data with minimal relevance (Trull, 1964).

When reviewing the responses from the pilot interview against the research objectives and considering against the lens of the TAM model, the quality of answers received could be considered fairly well established in the research topic. Whilst during the discussion there were times that the interviewee began talking specifically around certain technologies and intricate details of their workings, this information whilst providing a continuity of discussion and allowing the conversations to flow, did not hold much relevance to the questions. Having said this, the overall consensus of the interview discussions and relevance on the questions was considered well established. When questioned on their experience of technology adoption they were able to talk effectively and with detail around examples they had experienced directly relating to technology adoption, giving more then one example most times.

When discussing the adoption of technology and the constraints around it, the interviewee discussed key elements that directly related back to the TAM theory without the interviewee having prior knowledge of the TAM framework. They discussed the key elements they believed for successful technology adoption being ‘usability’, ‘efficiency’ and ‘usefulness’. They also discussed how prior to even adopting a technology, these factors played a key part in people’s approach to something new. When reviewing against the TAM model, these correlate to the ‘perceived usefulness’ and ‘perceived ease of use’ factors. The interviewee then discussed how certain people can be difficult to change as they are ‘stuck in their ways’. Again, reviewing against the TAM model this could directly link to the ‘Attitude towards using’ and ‘behavioural

intention to use' elements. Finally, the interviewee discussed the training and hands on approach to the implementation being key factors to solidify the adoption of a technology. This could then be considered the final 'Actual system use' step in the adoption of technology model.

In summary on the quality of the pilot interview, when considering against the aims of the research and reviewing the responses against the TAM theory, the responses received were generally well constrained to the research topic, gave good insight into the interviewees experience, knowledge and opinion of technology adoption and gave sufficient and detailed examples of the interviewees experience to aid in the reliability of the information given. As such, it was concluded that the style and structure of the interview questions allowed for a good quality response style and allowed for an open discussion, whilst also giving the interviewer the right tools to guide the discussion and keep within the research topic when discussions went outside the topic or became too detailed on specific items.

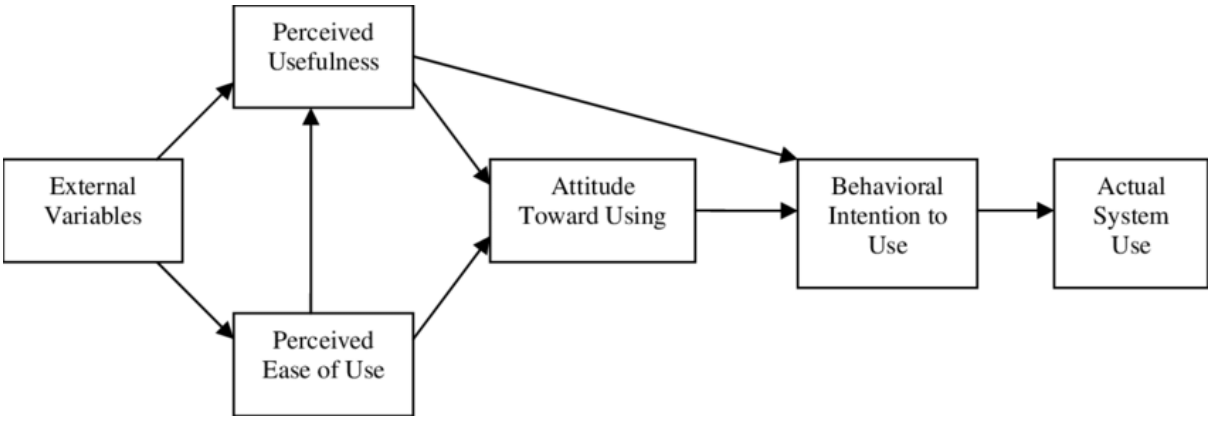


Figure 2.5; Technology Acceptance Model Diagram (TAM) (Davis, 1986)

EASE OF DISCUSSION

The ease of discussion of the pilot interview will be judged by how the interviewer and interviewee discussions flowed and whether the interviewer was required to constantly prompt answers or if the conversation naturally developed to provide suitable responses. Rosenthal (2016) discusses that "while the in-depth interview should feel like a casual conversation to the interviewee, the interviewer must be aware of the interviews flow and how the interviewee is reacting to the questions." The flow and discussion of the interview can directly impact the quality of the responses and therefore is a key part of the interview strategy.

Upon reflection of the pilot interview, the discussion between the interviewer and interviewee was fairly naturally flowing and whilst the main focal points of discussion were established by the prompt questions, the answers did not become stagnant with awkward moments in the interviews. The flow of conversation also became natural once the discussion topic had been reached. It was the elements of conversation where the most beneficial information and data was developed. Having said this, the conversation on occasions developed further then the prompt questions, so not all prompts were required or used.

Where the discussion naturally flowed and did not require all of the interview questions was a positive when reviewing the interview responses as the level of information was substantial. However, it did mean that the structure of the interview was not fully controlled and the review of the information may require more effort to establish the quality of the responses. Going forward with the main interviews, it has been decided to review the interview questions as these may not all be required and could be reduced in number whilst retaining the discussion prompts.

The clarity of the interview is being judged by the number of times the interviewee was unsure of what was being asked or asked the interviewer for clarity or to repeat something. This is being reviewed to identify if the interview prompt questions were clear enough the get the most relevant and successful responses as possible. If the interviewee is unsure of the question, it is deemed that the quality of response will suffer. From the pilot interview, there was only two occasions where this happened, where the questions responses had already been answered previously. Again the review of the prompt question to avoid duplication of questioning will aim to resolve this.

SUMMARY OF PILOT INTERVIEW

Interviews are a key way of understanding a persons insights, experience and knowledge and extracting relevant information on a topic. Seidman (1964) states that “recounting narratives of experience has been the major way throughout recorded history that humans have made sense of their experience.” He discusses the benefits of interviewing and how, different to quantitative approaches, it can allow people to tell stories, giving more information on a topic then may be obtained through other methods of data gathering.

The pilot survey is a crucial aspect in developing a full-scale research data gathering study (Teijlingen, 2013). The pilot survey allows the interviewer to establish whether the interview questions or prompts are well established to retrieve the relevant information they need when considering the research aims and objectives. It is also a good way for interviewers to practise their techniques and skills in interviewing prior to undertaking the full-scale interview process (Majid, Othman et al, 2017). It can also give a good insight into the level of detail required for solid data analysis and as such timings and question process can be altered to achieve the best outcome for the overall research findings.

As discussed previously, the key criteria established for the pilot survey was established for review and analysis of the effectiveness of the pilot survey. When reviewing the responses from the pilot survey against these criteria and as outlined in the above review, it was concluded that the pilot survey gathered sufficient and relevant data against the research aims. The information gathered was relevant to both the research aims and the chosen technology acceptance model and the provided a good insight into the experience and understanding of the interviewee. The timings and discussion of the interview were fairly free flowing with detailed information being provided, but without a constant requirement for the interview to be directed or steered. This provided a more open response rate, and whilst at times the interviewee discussed specific technology information, which was not pertinent to the aims, the overall discussion provided good responses relevant to the requirements. As such, the interview prompt questions will be carried forward to the full-scale interviewing process with minor adjustments to the prompt questions and the pilot interview responses will be taken into consideration in the final analysis of the data gathered.

10.4. APPENDIX D

INTERVIEW A – TRANSCRIPT

17th May 2022	33min, 14sec

00:00:42.280 --> 00:00:43.150
Interviewee A
OK. Can you hear me now?

00:00:00.000 --> 00:00:00.160
Joseph Elliott
Good Afternoon.

00:00:13.290 --> 00:00:14.290
Joseph Elliott
Can you hear me?

00:00:43.910 --> 00:00:45.220
Joseph Elliott
Yeah, found it. Can you hear me?

00:00:45.860 --> 00:00:47.190
Interviewee A
Perfect. Yep. Super.

00:00:48.320 --> 00:00:48.810
Joseph Elliott
Nice one.

00:00:50.250 --> 00:00:53.140
Joseph Elliott
Alright, just setting this up so.

00:00:54.190 --> 00:00:59.580
Joseph Elliott
I don't know if it showing it on yours, but essentially there's transcript going on so it just records all the words and stuff.

00:00:58.320 --> 00:00:58.640
Interviewee A
Yeah.

00:01:00.180 --> 00:01:00.930
Interviewee A
Perfect. OK.

00:01:01.470 --> 00:01:04.860
Joseph Elliott
What I will do just cause this one so particularly read through. So essentially the purpose of this interview is to essentially establish form your knowledge and experience your view on the implementation of advancing technologies in the UK retail construction industry.

00:01:23.220 --> 00:01:33.310
Joseph Elliott
And any reasons as to why technologies, either aren't being implemented effectively, or maybe even blocked.

00:01:34.830 --> 00:02:03.980
Joseph Elliott
So I'm going to record this interview now. The sort of purpose for this is to understand, you know, based on the interview and the questions that I asked or how it flows, get some feedback from yourself and then really I might have to do some tweaks or changes to then go forward with it. So you know, it's not too formal or anything, just pretty much the run through in a bit of a test trial.

00:01:37.750 --> 00:01:38.040
Interviewee A
Yeah.
OK.

00:02:09.420 --> 00:02:17.790
Joseph Elliott
So I don't think I need to record it or anything, so I've got the transcript going and that should just be that. I can send you a copy if you if you want it.

00:02:18.040 --> 00:02:19.690
Interviewee A
If I so desire for a bit of midnight reading.

00:02:19.250 --> 00:02:21.690
Joseph Elliott
Yeah. Yes, you can see what you've done and what I will do is drop you across the interview questions at the end of it again.
And then there's just a bit of a declaration, which pretty much says, you know, you understand that it's being recorded, and it's gonna be used in thesis and you're happy with that.

00:02:39.120 --> 00:02:39.450
Interviewee A
Yeah.

00:02:41.930 --> 00:02:43.260
Joseph Elliott
So it stays anonymous within the paper.

00:02:43.920 --> 00:02:44.290
Interviewee A
OK.
Yep.

00:03:02.070 --> 00:03:03.620
Interviewee A
Yeah. No, it's fine. It's fine.

00:03:04.760 --> 00:03:09.650
Interviewee A
I don't think I'll be giving away any information that can't have my name behind it, so that should be fine.

00:03:04.910 --> 00:03:05.460
Joseph Elliott
OK. Let's get stuck in.

00:03:14.520 --> 00:03:15.320
Interviewee A
Yeah.

00:03:27.590 --> 00:03:36.740
Joseph Elliott
Like, yeah, we might as well get started then. So question number one, is on your experience in your job role.

So have you had experience in your job role of implementing or adopting new technologies, either by yourself or people around you, that you have been included within?

00:03:47.140 --> 00:03:48.440
Interviewee A
Yes, there's there's a few different examples I was thinking about. Obviously I'll kind of give you the three if you like and then you can kind of obviously pick between them.

00:04:02.220 --> 00:04:03.210
Interviewee A
Several years ago I brought to the business a piece of a technology that basically you measured the system. So are you put a 2D PDF like we get most plans on you'd put it into a system. You would measure it. Obviously you tell it ceiling heights, etcetera.

00:04:25.110 --> 00:04:34.930
Interviewee A
And then if you set up a UM, whether it be a schedule, or whatever, and you've set that up into it.

00:04:35.850 --> 00:04:39.950
Interviewee A
It would then automatically measure all of your projects very, very quickly.
Umm, but that wasn't, uh, accepted by the business.

00:04:50.090 --> 00:04:54.940
Interviewee A
You've then got another one which we use all the time now, which is which is. As a blue beam and we basically use that to measure UM, everything, whereas you would have had in years gone by, scale rules all the rest. Everything gets printed off. Now you can pretty much not see a plan on anybody's desk as a result of that.

00:05:15.190 --> 00:05:15.620
Joseph Elliott
Yeh makes sense.

00:05:16.160 --> 00:05:19.240
Interviewee A
And the other one that I think probably has as much value 2 my main experience as anything else will be.

I've forgot the name, but they are the CAD software, where you affectively you have everything kind of 3D to stop anything, any clashes.

00:05:37.280 --> 00:05:37.590
Joseph Elliott
Yep.

00:05:39.380 --> 00:05:41.190
Joseph Elliott
OK, like Revit or something like that.

00:05:41.220 --> 00:05:44.950
Interviewee A

Yeah, yeah. And if you look on the whole at how often that is used compared to how often it could be used. The whole thing comes down to cost.

And Definitely. With the example that I gave you at the beginning, it's it's obviously a huge outlay. And It would take potentially away some people's role.

And where an effectively you would sit there as a MD whatever, and you'd have to explain and expense that you've got of a few 100,000 pounds.

00:06:25.600 --> 00:06:26.070
Joseph Elliott
Yep.

00:06:26.080 --> 00:06:36.400
Interviewee A
Umm. And you're not gonna see the value of that because I don't know. I mean it may return to 10 Grand, 20 grand value year on year. But you've gotta be able to sell that and effectively you've got to be able to show the fact that you are able to get the value back and it's going to affect the figures you're going to report if it's going to affect the person that moves into the role after you, you just don't care.

00:06:56.440 --> 00:07:09.130
Joseph Elliott
And what was the reason for the example you used, for it being stopped? Did anyone ever give you any actual feedback or was it just, No, we're not gonna do that. And you've taken from there your view of it.

00:07:11.250 --> 00:07:25.530
Interviewee A
It purely came down to just the initial expense and to be fair, I was fairly new to the business at the time. So walking in and suddenly pushing, I mean you bit of software I didn't think was the wisest move in the world, but It's that thing where it basically got up to a fairly senior stakeholder. They looked at it and looked at the cost of it and that's that's I think the big difference between between that and a blue beam technology that we all use now. You pay a monthly or or annual a subscription.

00:07:50.670 --> 00:07:50.960
Joseph Elliott
Yeh

00:07:51.670 --> 00:07:58.320
Interviewee A
So you then get the benefit of it without having to obviously have a huge initial financial outlay.

00:08:02.160 --> 00:08:11.450
Joseph Elliott
Do you think that being able to sort of either spread the cost or like that; say a subscription type cost is easier for the business to approve then?

00:08:11.990 --> 00:08:13.760
Interviewee A
Definitely. Yeah, definitely.

It's also from a point of view of people who are nervous of it, not convinced by it. They then see people using it. See people raving on it and then slowly go almost one step further and when you're your in that position. We had it had it and a few years ago where you've got to present back your workings.

I don't know; if you've got 30 square meters of ceiling. They've got 35. There is no argument either way. It obviously if you've measured it on CAD, then sorry if you've measured it by hand, you've got to remeasure it because you probably didn't mark up a plan or if you did, you threw it in the bin.

00:08:43.700 --> 00:08:43.980
Joseph Elliott
Yeh so the development and benefits of technology evolution.

00:09:01.740 --> 00:09:06.470
Interviewee A
Now, if if I'm asked for a particular measure, is One file, send it straight across and its there in black and white and it and it will obviously tell you exactly what that particular measure is.

00:09:16.230 --> 00:09:22.060
Joseph Elliott
Yep. So then when you've actually used like a new technology like you've mentioned like blue beam.

00:09:22.700 --> 00:09:30.350
Joseph Elliott
So what sort of your experience of coming to grips with the new technology then having to use it?

00:09:32.790 --> 00:09:36.020
Interviewee A
I think on the whole, a lot of it is down to you to work out how to use it. So if you take that as a perfect example I was, I was probably one of the earlier ones to be using it and I would I would use it. I would do it in in a manner that I knew what to do.
And you would speak to other people and they would be doing exactly the same, but to a slightly different a degree. But the time you put that learning together. We all found out that we had a far better understanding of actually how it how it worked. But rather than a piece of software being rolled out to the whole company and have proper training manual being put together that just doesn't exist.

00:10:09.610 --> 00:10:09.850
Joseph Elliott
Yeah. Do you think if that did exist, would it benefit or change the way that sort of technology could be implemented?

00:10:30.570 --> 00:10:43.680
Interviewee A
Uh, massively. And I think I think even if you just took something as basic as word or Excel, as an absolute classic, if you know how to use all the different formulas and two a degree you will have half the people in this office saying I know how to use Excel and by that they mean they can do a sum formula and add up a couple of columns.

If you then have somebody that understands it to the next level up, they'll be doing vlookups but onto different sheets. You could have me, for argument sake, doing a task that takes 10 minutes and the exact same task takes somebody three days just because they don't know how to use a vlookup.

00:11:22.010 --> 00:11:22.560
Joseph Elliott
Yeah.

00:11:22.820 --> 00:11:31.300
Interviewee A

And it's that level, but there's obviously not the training because we all know how to use Excel, so nobody would put themselves forward for it.

00:11:32.910 --> 00:11:38.090
Joseph Elliott
That that makes sense. Yeah. I think that's just one of the key points for that, so what your touching on is the training aspect mentioned, obviously the experience stuff, but if you had to highlight the key factors of adopting a new technology and making it successful and rolling out for the business. What would you say those are?

00:11:59.320 --> 00:12:00.010
Interviewee A
Uh.

Cost.

And usability.
And the problem is, I think both of those are so varied.

It is very, very different. Difficult to specify exactly what anybody means by that cost to one person, then more than happy signing it off. And to somebody else maybe you've got no chance.

Umm and usability in exactly the same way like I'm trying to find and I've always tried to find what is the most efficient. And if you ask every different person, they will all say they use something else and it's the best thing and it's finding that balance, there'll be many people swear by their scale rule. They will always measure with that and they don't want to use a technology. And it's almost getting those guys on board. So that actually they see the value in not just the initial measure. But the opportunity to come back to it at a later date when somebody as a questions it bang it's there as quick.

And I think as far as the cost is concerned, it's the people who are signing that cost off understanding the Value. And the value in in that.

00:13:31.380 --> 00:13:45.000
Joseph Elliott
I'm sorry when you say there's certain people have to sign it off. Can you just elaborate on that? You know it. Is it something that changes or is it something that's quite strict and process driven?

00:13:46.190 --> 00:13:48.480
Interviewee A
It's very good point actually because I was I was initially thinking from a point of view of cost, but obviously in the world we now live in its cost, it's security, it's so many different aspects.

That. Yeah, it's obviously got to be able to link into the server. So are they safe? Secure all the rest of it. Or they gonna obviously give a weakness to it from a cost point of view. It's obviously got to bounce up the levels enough for whoever can sign off that that value of work.

00:14:28.120 --> 00:14:28.530
Joseph Elliott
Yep. That make sense

00:14:31.780 --> 00:14:50.020
Interviewee A
And I think the problem again with UK construction, even though at the retail arm that we cover is a small part of that, a lot of the people that will sit at the top of that will be Older that don't

necessarily understand the benefits that some technologies have. So you know about our age. We're all set there to go why on Earth are you using pen and paper?

But at fifty / 60s, they're also out there going I only want a pen and paper.

00:15:14.190 --> 00:15:14.910
Joseph Elliott
Yeah, Almost stuck in their way a little bit with what they know?

00:15:21.010 --> 00:15:21.640
Interviewee A
Yeah.

00:15:23.500 --> 00:15:31.150
Joseph Elliott
So then you've mentioned obviously the sign off processes and sort of certain influences, but is there specific Key points within an organization that you think influence whether or not widely and sort of holistically any new technology would be adopted well, And from high level all the way down to the bottom, you know, certain factors that could influence it?

00:15:52.490 --> 00:16:09.080
Interviewee A
Yeah. So it's, it's, I think you've got a piece, if I'm understanding the question correctly, where it's if anything to do with an environmental at the moment. Obviously it gets all the green lights and there's a lot more.

00:16:12.170 --> 00:16:42.740
Joseph Elliott
I think more internally rather than you know there there's gonna be certain key factors that are processed driven and you know certain directors that will say yes or no but more sort of informally than that. Do you think there's certain things that could influence just on a day to day someone like yourself trying to use and implement our technology you know is there something that's gonna change your mindset of whether you want to get on with this or something that could potentially block it.

Interviewee A
So mine. Yeah. So mine would all be around the usability in the value, so how easy is it to use in line with what you're currently doing? So if you think any any kind of Microsoft system, usually gets used and integrated to what we do very very quickly because the usability and there's videos to teach you how to use it, there's all of that online. Simple is it's when you start coming away from that.

And then then you've almost got a transfer data across a couple of different pieces of software. That's that for me. Is where, where it would fall down and whether I would push it as hard for it to go any higher up.

00:17:37.200 --> 00:17:41.830
Joseph Elliott
No, that makes sense. So where would you always get that information from? To then judge for yourself, and for those key influencers.

00:17:49.310 --> 00:17:57.680
Interviewee A
I'm probably not give you the official right answer, but I would use it and if it was easy to use. And it's if I think it is good

00:18:00.780 --> 00:18:05.250
Joseph Elliott
That makes sense. So like you need to know it or essentially just try it first.

00:18:05.740 --> 00:18:11.120
Interviewee A
Yeah, yeah. I don't want somebody to tell me how good it is and all the rest of it because. What works for them won't necessarily work for me. I wanna obviously play with it. If it works, it's great. If it's not. If it doesn't work you can have it back.

00:18:23.810 --> 00:18:28.910
Joseph Elliott
That are made sense, so you know. So someone almost word of mouth. Doesn't play as big part to you as actual trial.

00:18:34.420 --> 00:18:34.950
Interviewee A
Definitely.

00:18:44.990 --> 00:19:05.710
Joseph Elliott
So then we sort of touched on it a little bit. You mentioned sort of with the influences also some of the things that you think would stop it, but what do you think would be the biggest blockers in the organization, you know the things that would stop this from being not just implemented full stop but implemented well, throughout the entire business, right down to people on the ground that need to use it?

00:19:08.160 --> 00:19:10.580
Interviewee A
Yes. So I think I think It's the same kind of situation, isn't it? So if I can, and I'm thinking about like if I put information on to the server. So I've used a particular piece of software or I'm a classic, OK, you've just handed over a project and I've completed at the snag list and you then got to send it out as a PDF because somebody could be using Apple or could be opening it on a laptop there's so many different devices that could that could be opening that up. And so, it's about the ease of somebody actually opening it up, understanding what's going on. Because let's be honest, we all have a retention span of about what is it, 45 seconds.

00:20:06.930 --> 00:20:08.060
Joseph Elliott
Some people even less.

00:20:09.730 --> 00:20:11.380
Interviewee A
Yeah, yeah.

00:20:13.130 --> 00:20:15.360
Joseph Elliott
Yep, no, that makes sense. So you know then again It sounds like it's come down to like the usability factor.

00:20:20.430 --> 00:20:20.770
Interviewee A
Yeah.

00:20:21.760 --> 00:20:27.670
Joseph Elliott
So then I suppose if someone presented you with a new technology going forward.
How would you then look to evaluate it? So before you took it to the business? What sort of

things would you be looking for so you can make sure that like you really want to drive this forward, you really want to make it a win.

How would you then evaluate it yourself to say actually, Yeah, I think this is gonna work well in the business or no, I don't think it will.

00:20:50.850 --> 00:20:52.360
Interviewee A
Yeah, so the key things the key things, I have said would have been;

How how easy is is is the functionality so not necessarily can I understand it? But if I give it to a - I don't want to be ageist - But let's say a 55 year old who likes his pen and paper. Could he understand how how to use it?

00:21:21.390 --> 00:21:21.810
Joseph Elliott
Yeh, I understand what you are saying.

00:21:22.530 --> 00:21:25.730
Interviewee A
How easy is it gonna integrate into what we're currently do? And I think that that's fundamental. If we all need a completely separate piece of hardware, it's just never gonna work. Nobody's gonna carry around an additional phone or an additional a device.

00:21:28.150 --> 00:21:28.510
Joseph Elliott
Yep.

00:21:42.990 --> 00:22:03.940
Interviewee A
And then obviously if I can see value from the point of view, you wouldn't need to hire an additional QS, an additional PM, whatever you can, you can value that back. And I think the way most people would see This is why am I gonna have that software at at £100,000 if I could employ somebody for 30.

00:22:04.730 --> 00:22:05.130
Joseph Elliott
Yeh. So there needs to be a business case as well as commercial.

00:22:14.370 --> 00:22:14.940
Interviewee A
Yeah.

00:22:21.080 --> 00:22:21.620
Joseph Elliott
That makes sense?

00:22:24.910 --> 00:22:34.620
Joseph Elliott
So then if you you look today, you look to those key points and you thought, ‘yes, I I wanna go ahead with this technology and wanna bring into the business and you know.

How would you look to then do that? Would there be specific ways in which you would almost sell it or, you know, or how would you then try and integrate it without everyone just going? No, won't use this.

00:22:36.590 --> 00:22:36.910
Interviewee A

Yeah, So I would I would look at - I have a few different kind of mains main selling pitches, but again it it would all depend on. Where the pitch was was gonna end up. If it was going to the commercial director, obviously it would be massively focused on cost. What would your saving be and how is that gonna boost the underlying profit if it was going to more of a?

00:23:26.570 --> 00:23:36.860
Interviewee A
A delivery a director. It would be more around your efficiency. You can pick up the information from the road. You can do all of that and and effectively how it's going to improve.
There, them individually or their teams. Unfortunately, it probably crosses every single as a bridge, which is why it's very difficult to get everybody to buy in into any kind of change.

00:23:50.290 --> 00:23:50.590
Joseph Elliott
Yeah. That's actually at one thing, might work for one person, but not not for another.

00:23:57.100 --> 00:23:57.750
Interviewee A
Yeah.

00:24:00.490 --> 00:24:25.570
Joseph Elliott
OK. So obviously you've mentioned like the the usefulness of things like that, but say now you see it as being a great investment, great opportunity, but you also see that you know then there might not be the perception of it being useful until people have actually used it and might be, you know, a massive cost in implication. Is there a way you would then try and go about selling it in and you know the messages or you know, how would you then try and get people to essentially win over to the idea of it and start using it?

00:24:37.130 --> 00:24:38.580
Interviewee A
Yeah, I think.

00:24:39.450 --> 00:24:52.610
Interviewee A
I think the key would be obviously everybody's time is massively, massively limited and it's one of those ones where you almost just need to go. This is a superb piece of software. It's set up, take it home. I do whatever your password. Is this your login, Details of that.

00:25:00.080 --> 00:25:00.350
Joseph Elliott
Yep.

00:25:01.040 --> 00:25:09.230
Interviewee A
I'd go and play and if they can't log into it or that kind of writes it off as just straight away.

00:25:09.900 --> 00:25:10.630
Joseph Elliott
Yeah.

00:25:10.760 --> 00:25:14.180
Interviewee A
Because obviously usability isn't there.
Umm, but but purely on the basis of how I would be sold by it, I would be selling it on a similar basis.

00:25:24.340 --> 00:25:26.730
Joseph Elliott
Yeah, the hands on approach that that makes sense.

00:25:25.790 --> 00:25:26.090
Interviewee A
Yeah.

00:25:29.610 --> 00:25:49.600
Joseph Elliott
So then the last couple of questions and we're almost done is pretty much just more of this sort of a general performance yourself. You know, is there anything else that you believe is important you know in, in the topic of new technologies in UK retail, anything that you see sort of going forward or anything really you wanna comment on?

00:25:51.590 --> 00:25:52.640
Interviewee A
Uhm, well.

I'm a big believer in the fact we are so far behind in where we could be, it's ridiculous.

00:26:03.660 --> 00:26:08.590
Interviewee A
And what I mean by that is just the fact that we, we have so many different processes, but everything is manual. And I mean, even at the point you put in a report. I'm sure you put the site managers details and the project number into the same document - That's probably got a lot of different forms - Several times.

00:26:38.300 --> 00:26:38.710
Joseph Elliott
Yeah.

00:26:38.690 --> 00:26:46.840
Interviewee A
And it's and it's one of those ones that's just a complete waste of time because all of that could be automated, automated.

00:26:40.050 --> 00:26:40.760
Joseph Elliott
I know that pain.

00:26:47.570 --> 00:26:48.040
Interviewee A
Even if even if you had had a suite of Microsoft Word as documents. If somebody actually took some time, you would input the information once the rest of it would be populated.

00:26:56.710 --> 00:26:56.960
Joseph Elliott
Yep.

00:27:03.880 --> 00:27:08.210
Interviewee A
Umm. And there's that's a a very simple example of. So many occasions where we could speed up and automate the business so much more so than we currently do.

00:27:22.750 --> 00:27:23.750
Joseph Elliott
Yeah, I know exactly what you're saying.

00:27:24.310 --> 00:27:31.110
Joseph Elliott
So that's one of the difficulties in that is the sort of the time that since Labour for all sorts of things like that.

00:27:25.230 --> 00:27:25.450
Interviewee A
Yeah. Definitely.

00:27:33.040 --> 00:27:51.780
Joseph Elliott
And then finally last question, is if you had to give any advice to another contractor or an organization in UK retail that we're looking to implement a technology, but wanted to implement it effectively throughout the whole business, good high level to low level. What would be your advice?

00:27:50.700 --> 00:27:50.920
Interviewee A
Yeah. As in, what would be the the at a key piece of software? I would advise or what would be the advice to?

00:27:58.820 --> 00:28:08.370
Joseph Elliott
So the process, how would you know they've just been given a new software. They know it's gonna be brilliant, but they wanna make sure everyone in the company starts using it effectively.

00:28:05.310 --> 00:28:05.610
Interviewee A
Yep.

00:28:09.210 --> 00:28:11.220
Interviewee A
OK, my Thought would be to make sure everybody understands the basics and runs with it. But also that you have almost a staggered approach.

00:28:26.830 --> 00:28:40.100
Interviewee A
And there should be training session, so obviously you get to use it and you play with it. Everybody understands it right now. Let's take it to the next level and I don't know whether that be 5 steps and you can choose when you do it because some people are gonna run straight to.

00:28:41.140 --> 00:28:42.190
Interviewee A
As a Step 3. Some people are gonna need a few months on step one. But I think it's fundamental when you have these large pieces of software that that you can actually do so much more with it and people know that you can do that. So then you get the full package, If you're paying as a £200 a month for it, or £200,000 at to buy at a software you want to make sure people are getting the full value out of it rather than effectively just skimming the surface.

00:29:26.080 --> 00:29:26.770
Joseph Elliott
Right, that's great.

00:29:32.190 --> 00:29:32.780
Joseph Elliott
And that’s is the last of my questions.

00:29:32.210 --> 00:29:35.200
Interviewee A
And if that was supposed to be 30 minutes, that was pretty good.

00:29:34.420 --> 00:29:44.310
Joseph Elliott
Alright, yeah, I'll think that the actual timing. So that's the end of the interview. That's pretty much bang on everything needed ready. It's quite interesting. So there's that the way has to be done is like I have to base it on like a certain theories and.

00:29:55.690 --> 00:29:55.950
Interviewee A
Yeah.

00:30:03.020 --> 00:30:17.970
Joseph Elliott
And that's all about the technology perception. So there's certain criteria to effectively implement it already, and it's to speed effectiveness, a perceived usefulness and perceived like ease of use or value for money.

00:30:18.330 --> 00:30:19.100
Interviewee A
Yeah, yeah.

00:30:18.510 --> 00:30:49.430
Joseph Elliott

Then it's after that. It's then usability cost against like benefit and that sort of thing. So it's it's quite interesting to you. Literally hit it, hit the nail on the head like throughout your answers, you know in a different way of saying that you've said exactly what the the actual implementation theory says. So I'll yeah. No, that's interesting. So what I to my next step then is pretty much over the weekend I'll put this transcript.

00:30:29.400 --> 00:30:29.690
Interviewee A
Yeah.
I'll take that.

00:30:49.890 --> 00:31:19.760
Joseph Elliott
Through like a data model software and what it does is it pick out keywords that have been said and not or key phrases that mean the same thing and generate like sort of high level. This is what you were talking about. These are the things against each question. So then come out the back of it and say Oh yeah, these are your two points. There's the questions I asked the sort of the high level responses. So don't go into the detail and then what that does is when I've done.

00:30:54.000 --> 00:30:54.320
Interviewee A
Yeah.

00:31:06.430 --> 00:31:06.950
Interviewee A
OK.

00:31:16.820 --> 00:31:17.110
Interviewee A
Yeah.

00:31:20.200 --> 00:31:49.870
Joseph Elliott
Five or six of these you can then review against each one. So like you said about received usefulness, the next person might say the same and then what I'm doing as I'm then evaluating that against the theory model. So I can say actually this theory model works perfectly in retail UK construction and therefore he go businesses use this model. And if you want to implement a new technology, this is how you do it. And that's essentially the conclusion. So to be honest.

00:31:52.920 --> 00:32:01.850
Interviewee A
Very interested to see as well how my opinion sits when you then speak to others of different ages throughout the business.

00:32:02.440 --> 00:32:02.980
Joseph Elliott
Yep.

00:33:13.290 --> 00:33:14.590
Interviewee A
Right. We'll leave this one that.

00:33:14.590 --> 00:33:19.480
Joseph Elliott

Thank you for your time. Appreciate it and I'll catch you later.

Cheers.

Bye.

00:33:15.910 --> 00:33:19.680
Interviewee A
Alright, no worries all speak soon. Yeah, cheers.

Bye

10.5. APPENDIX E

INTERVIEW B – TRANSCRIPT

8th August 2022	30min, 20sec

0:0:0.0 --> 0:0:14.620
Joseph Elliott
Afternoon. Thanks for your time. How are you

I'm going to start by running a transcript on Teams that will record this interview. Hopefully this is ok?

0:0:15.120 --> 0:0:15.610
Interviewee B
Hi. I'm good thanks and no problem.

0:0:16.110 --> 0:0:22.360
Joseph Elliott
Good good, OK I'll start now. I don't know if it comes up on yours, but it comes up just one right hand side. It just literally everything we say it will note down.

0:0:22.800 --> 0:0:23.590
Interviewee B
Yep, no worries

0:0:24.30 --> 0:0:54.580
Joseph Elliott
What I'll do is I'll run through a little bit of an introduction of what sort of purpose of all of this is, what I'm actually researching and everything. And then, yeah, we'll just run through one by one through the questions. There's no right or wrong answers. It's purely your sort of experience and your opinion of everything. And then what I'm looking to do after that is take everyone's interviews doing analysis on it, a bit of sort of raw data analysis and try and get some ideas or correlations between the interviews.

0:0:55.660 --> 0:1:7.590
Joseph Elliott
And then, if you're aware of it, there's a theory out there called the technology acceptance model. So I'm then trying to review it against that. I'll sort of come into that in a second though

0:1:13.550 --> 0:1:13.990
Interviewee B
No worries.

0:1:8.750 --> 0:1:38.650
Joseph Elliott
Feel free to ask any questions as well, while I'm just wondering through this first bit, I won't be a couple of minutes, but essentially what I'm what I'm looking at is a research degree based on the problem; that is low productivity levels in UK construction. One of the biggest things is the drop or the lack of productivity, or perceived productivity when reviewing against things like manufacturing. So like car manufacturer and industrial.

0:1:42.150 --> 0:2:11.540
Joseph Elliott
Umm, one of the things that is that a lot of researchers sort of been done on other industries is new technology. So for example, car manufacturer, a new piece of technology or equipment comes in to make a car door 10 times quicker. They then implement that, roll it out and can

immediately see their efficiencies and how it benefits the entire project and another project. So what I'm looking at is more of a general approach.

Can technology have the same impact? Can it immediately benefit construction with obviously some constraints and then looking at construction more specifically in terms of the retail sector where it's more of a heterogeneous approach, which is that it doesn't replicate over and over. So you know we could go into one building that's got a load of constraint because it's grade listed and then the next building is an office block that has completely different constraints because there's a live environment on different floors. So it's understanding how it's not one of the manufacturing industries, it is completely different. But can technology benefit it?

0:2:58.40 --> 0:3:10.960
Joseph Elliott
But more so why the technology isn't immediately doing that now, so when you look at the curves of new technology, why isn't it an immediate correlation of; Here's a new bit of technology. Here's it being implemented. Here's the benefits.

0:3:11.600 --> 0:3:13.550
Joseph Elliott
So the first part of my research is looking more in terms of like the research that's already been done of how technology can help construction, but the second part, which is more where you guys come in and the interviews is how technology is actually being adopted and how that adoption, especially in retail construction is either facing barriers or just not being implemented right. And how I can then off the back of this recommend for construction companies.

0:3:44.150 --> 0:3:49.870
Joseph Elliott
Got technology the way forward, but more so here's how you can improve your technology adoption.

0:3:50.530 --> 0:3:59.300
Joseph Elliott
Umm. And that's pretty much the sort of the gist of everything that I'm looking at so done quite a bit of research in terms of the field that's out there.

0:3:59.980 --> 0:4:23.320
Joseph Elliott
And as I show, you can imagine there's lots on big bill construction, lots on the big stuff that happens in London. You know the the multi storage complexes and and big sheds essentially. But there's barely anything on the small retail, you know in an existing building type thing. So that's really where we're trying to sort of hit the niche and go from.

0:4:25.140 --> 0:4:26.70
Joseph Elliott
Does that make sense?

0:4:26.770 --> 0:4:28.360
Interviewee B
It does. It does indeed.

0:4:30.280 --> 0:4:36.70
Interviewee B
Yeah. Yeah. You already really started a million conversations in my head with that with that introduction, as there is a lot to discuss

0:4:36.160 --> 0:5:7.70
Joseph Elliott
Yeah, and it is of the things that I found most difficult, to be honest, is trying to narrow it down.

It's obviously, I started with this whole problem of can technology help construction and then it was just such a massive thing and it was, you know, yes, it can, but be more specific than it was, OK we looked in the retail sector and then again it was yes, it can. And then I started going down the roots of specific technologies that are being implemented at the minute. And again, it's such a wide sort of sector of knowledge out there.

0:5:7.310 --> 0:5:24.800
Joseph Elliott
Then looking deeper. Why isn't that technology actually benefiting? And that's why I've come to sort of the inclusion of there's something stopping a new technology from just going like everyone here it is. It's amazing. Now everyone go out and use it and that's why I'm trying to find the problem and the solution.

0:5:25.140 --> 0:5:25.500
Interviewee B
Hmm.

Yeh, right man.

0:5:27.750 --> 0:5:42.260
Joseph Elliott
Yeah. So What Ill do is just get cracking with the questions. If at all, you don't understand the question or or need anything, just feel free to say. And as I say, there's no boil answer. It's purely just what your views are.

0:5:42.560 --> 0:5:42.820
Interviewee B
Yep. No problem

0:5:43.470 --> 0:5:45.420
Joseph Elliott
So the first one is.

0:5:46.90 --> 0:6:0.480
Joseph Elliott
How have you experienced the implementation or adoption of new technologies within your current role and what are the main positives and negatives of the implementation of the new technology that you found?

0:6:1.470 --> 0:6:8.940
Interviewee B
You know where to start. I supposed two of the big ones are the 3D design clash detection piece and.
All of those really, probably laser scanning was another big one that that we bought in so.
In terms of how have I experienced it, I've now been main contractor side for nearly eleven years and prior to that I was consulting.
And adoption main contractor side. It Is a challenge. Specifically retail.

0:6:40.60 --> 0:6:43.690
Joseph Elliott
Is it more of a challenge than it was when you were on the consultant side.

0:6:45.310 --> 0:6:48.760
Interviewee B
Uh, thats a good question.
No, I don’t think. More just the challenges are different. I would suggest I think in terms of willingness to spend money on technology, I'd say that's easier once your main contractor side.

0:7:3.290 --> 0:7:5.180
Interviewee B
And actually implementing it. It's probably harder. So I would say it, it shifts when you consultant side.

0:7:14.400 --> 0:7:14.770
Joseph Elliott
Yeah.

0:7:12.350 --> 0:7:28.680
Interviewee B
It's difficult to get them to spend money because I think they've generally got a little bit less floating around. And so actually getting over that barriers a bit more of a challenge. But then once you're over that barrier, I would say adoptions easier because consultants are your generally in a single discipline environment as a rule.

0:7:29.170 --> 0:7:29.540
Joseph Elliott
Yeah.

0:7:29.760 --> 0:7:31.530
Interviewee B
So it's a far less broad. Anything that you're trying to get adopted, so probably easier on that front.

0:7:39.940 --> 0:7:50.900
Interviewee B
And that switches once your main contractor side. I think there's lots of opportunity everywhere and there's, you know, there's desire to try and find opportunity to streamline things and improve the approach, but we're inherently quite an old school kind of industry, and I think it's more of a generational thing. There's a lot of cultural approaches that tend to impede on success.

0:8:12.20 --> 0:8:12.280
Joseph Elliott
Yeh.

0:8:12.230 --> 0:8:17.320
Interviewee B
But the adoption of technology, I would say and it's probably compounded in the retail side of things.
Because successful projects are generally delivered by people with experience and certain way of doing things.

0:8:25.400 --> 0:8:25.680
Joseph Elliott
Yep.

0:8:26.140 --> 0:8:27.780
Interviewee B
So yeah, that.

0:8:28.860 --> 0:8:30.60
Interviewee B
And it's definitely a challenge.

0:8:34.60 --> 0:8:42.690
Joseph Elliott

So then what do you see as the key Success Factors for actually implementing a technology and adopting it?

0:8:46.0 --> 0:8:47.70
Interviewee B
That's a good question.

0:8:49.900 --> 0:8:51.230
Interviewee B
I think probably.
Uh, critical one is….

0:8:56.130 --> 0:9:1.260
Interviewee B
You've got to identify either the problem that technology is resolving.
Or where it's improving something.

0:9:5.10 --> 0:9:5.460
Joseph Elliott
Yep.

0:9:4.750 --> 0:9:9.680
Interviewee B
And I think all too often, a lot of main contractors run into. Being sold to technology as opposed to identifying what the value is to them. So Yeah, I would say that's the first thing. You've gotta be improving something with technology. Otherwise what's what's the point?

0:9:23.780 --> 0:9:24.150
Joseph Elliott
Yeh that makes sense .

0:9:24.660 --> 0:9:29.350
Interviewee B
Yeah. So that that would be one factor is making sure that it's fixing the problem.

0:9:30.750 --> 0:9:33.900
Interviewee B
Or addressing a weakness in in the existing approach to it.

0:9:39.260 --> 0:9:40.40
Interviewee B
And will it improve it.

0:9:45.80 --> 0:9:45.530
Joseph Elliott
Yep.

0:9:41.240 --> 0:10:11.370
Interviewee B
Probably not a measured or objective pilot, so once you've got a technology what you know, I think we run into doing something without understanding how we're gonna measure the impact or benefit of that in in an objective way. Quite often I've seen it a lot from the guys that OK, we fall back on a very subjective Joe blog said it was really good. Therefore we're gonna spend £1,000,000 a year on this new platform and rock on with that. And then that just doesn't seem like a. So well-rounded approach. So yeah, I think sometimes We buy a piece of technology, a platform, hardware, whatever is and we just run straight into implementing it without really knowing what we're measuring in terms of success. And then we don't know if it was successful at the end of it, but having wasted a lot of money on the project, you've got an inherent kind of

desire to go. It wasn't a waste of money. It was valuable. So I would say we don't really consider our approach to implementing new technologies very well would be another one.

0:10:40.600 --> 0:10:41.50
Joseph Elliott
Yeah that makes sense.

0:10:42.510 --> 0:10:48.740
Interviewee B
I think we probably like, well, this is changing slightly lack of top down kind of support and implementing change.

0:10:55.840 --> 0:10:57.180
Interviewee B
That is changing although I think the support is just a blanket technology is good crack on and do it type thing rather than specifics around things. So I still think that needs addressing and I think the last one is In my experience, we just don't train people.

0:11:13.710 --> 0:11:27.300
Interviewee B
Something's its great and it could be really good, but we don't train people and consequently it's nowhere near as good as it could be. Isn't rolled out effectively. People don't understand it, and it might add some value, but Probably 9 times out of 10 scratching the surface of.

0:11:31.810 --> 0:11:32.140
Joseph Elliott
Yeah.

0:11:32.10 --> 0:11:33.720
Interviewee B
What could be the value if it was well managed in terms of rollout and implementation.

0:11:40.680 --> 0:11:47.190
Joseph Elliott

That's pretty interesting. Its interesting about you say like there's not necessarily the measurement for success as well, that's that's quite an interesting one that.

0:11:53.690 --> 0:11:54.800
Joseph Elliott
Yeah. So say.
You can you roll out 100 different new things, but if you're not, you're not clear up front measurement as to how you're measuring it? How can you then define whether or not they were successful? You know you're just spending money on stuff for the sake of it.

0:12:9.560 --> 0:12:10.850
Interviewee B
I think if you if you look at it in manufacturing, you know, they'll identify problem. They'll look at solutions, they'll find the solution that fixes the problem and then measure that they have a plan for how it's gonna be rolled out, which will include training and the timeline. We just don't do any of those things. It's just we couldn't be further from, I mean, in fairness, the analogy of manufacturing.

0:12:35.780 --> 0:12:40.30
Interviewee B
It's a good thing and a bad thing. It's obviously a very good industry to try and replicate, but then on the flip side of that…..

0:12:43.100 --> 0:12:47.840
Interviewee B
Especially in the retail sector, where you working in potentially grade one listed building one minute or Some 1970s building the next minute straight out of the ground in another context is the variable associated with what we do.

0:12:59.200 --> 0:13:10.600
Interviewee B
Manufacturing has a very fixed kind of in the areas where we can fix stuff, we absolutely should be. But again, you just need to identify that, don't you? You need to work out where you can apply something in a standard and fixed way versus where you've got to do something bespoke to a situation because the situation dictates that. So yeah, I think we've got some complexities that manufacturing doesn't have,

0:13:26.250 --> 0:13:27.50
Joseph Elliott
Yep, that's it.

0:13:36.940 --> 0:13:37.530
Interviewee B
Yeah.

0:13:32.130 --> 0:13:39.840
Joseph Elliott
Spot on, So, you've also just answered my next question, which was how does it relate specifically with retail, but you've touched on that one.

0:13:40.300 --> 0:13:42.160
Interviewee B
I got in the rounds.

0:13:43.490 --> 0:13:47.600
Interviewee B
It's difficult, isn't it? I don't know If you take construction broadly.

0:13:48.480 --> 0:13:50.110
Interviewee B
I don't think.

0:13:51.240 --> 0:13:57.790
Interviewee B
Because of the other sectors will work in existing buildings, other sectors will build new and retrofit existing so.

0:14:4.40 --> 0:14:4.200
Joseph Elliott
Yep.

0:13:58.600 --> 0:14:10.130
Interviewee B
Arguably, there's nothing specifically unique to retell. I don't believe. I think if you've, if you've got a problem, the principles that you can apply to it, I think the biggest problem with retail is….

0:14:11.270 --> 0:14:13.920
Interviewee B
On a high repeat client basis.

0:14:15.870 --> 0:14:16.650
Interviewee B
They dictate.
Which takes our opportunity away. If you've got a big £300 million central London office development then?
That client probably hasn't delivered a £300 million central office, so they're reliant on us as a main contractor to understand that. And if we're going to implement something that we believe is a value or pilot in that context, you can build that into a program.

0:14:39.620 --> 0:14:39.900
Joseph Elliott
Yeah.

0:14:40.440 --> 0:14:50.370
Interviewee B
In the retail world, because I don't know, take any of any of the banks, any of the food retailers like ****** in it, in the retail context, they've built them or been there hundreds of times before, so they have a program in their mind of what they want you to achieve, which doesn't allow you to build in for piloting something or, you know, I think this is one of the biggest problems with the retail side of things is your client almost dictates your program to a large extent.

0:15:7.600 --> 0:15:7.970
Joseph Elliott
Yes.

0:15:7.680 --> 0:15:17.60
Interviewee B
And so you can't build in any innovation or adoption technology because you're only safe way of delivering it is the way you deliver it before.

0:15:17.560 --> 0:15:24.630
Joseph Elliott
Yep, so you almost constrained. So what you've done previously, therefore you know is tried and tested

0:15:23.70 --> 0:15:34.560
Interviewee B
It's a bigger risk to step outside of that in the context where you've got a repeat client that has a expectation or program based on previous delivery. So you know it may be that a pilot is very rarely going to improve on previous approach.

0:15:42.70 --> 0:15:57.490
Interviewee B
Yeah. I would say that that's a key challenge in retail. There's no room, should the clients have experience of construction projects because they have big estates and mass rollouts and that kind of fixes the approach and doesn't make it very flexible.
But well, you know. Flexible. Sure. Exactly. Right that it doesn't make it very flexible and adopting different approaches in a risk free way to still meet the client requirements. So suggest the risk would end up being ours if we did try and do anything. And that's why you get some reluctance, I would suggest.

0:16:21.220 --> 0:16:21.550
Joseph Elliott
Yeh that makes sense.

0:16:30.390 --> 0:16:54.720
Joseph Elliott
So then the next one is in your experience, what are the specific key SuccessFactors and

barriers that relate to retail construction when looking to adopt or implement a new technology? So I suppose before you've actually got it on board, when you're looking at a new thing about bring it into the company, what would then you look to be the SuccessFactors and what do you think are the barriers?

0:16:58.720 --> 0:16:59.200
Interviewee B
I think.

SuccessFactors have always got to be measured against what was done before, hasn't it? I would suggest so you know. You've gotta be making improvements. So if there's no improvement, why would you adopt A technology to into the business? So that would be the first thing. Has it improved what was there before?

0:17:20.40 --> 0:17:22.10
Interviewee B
Quite often I would say It moves a problem as opposed to fixes it, so you end up something might take less resource for one person, but it creates a problem for others and that often isn't measured. So I think it's gotta be seen all round as well.

0:17:35.570 --> 0:17:51.710
Interviewee B
And you know, it's easy to create cottage industries like the BIM side of things, where you need a resource to facilitate it. But your savings then being eaten up on planning and implementing something that so that often isn't measured, it's easy to turn around and go all we resolve 2000 clashes on a project and a thousand of those would have been missed if it wasn't for us being part of the process. But you then got paid for people to do that. The software to implement it. So I think things are measured around. So I think making sure that it's addressing measured against previous delivery in terms of identifying would be a fair success factor.

0:18:19.70 --> 0:18:20.120
Interviewee B
And barriers.
I cannot think, it just goes back to before. I think we're constrained.

0:18:26.90 --> 0:18:28.20
Interviewee B
You know, we put hugely variable projects.
And those projects are often relying on the experience of site teams and what not to deliver, so you can't negate the value in that experience, but that experience will fall back on how we delivered it this way before, so therefore we'll deliver it this way again to be sure that we will deliver it.

0:18:50.540 --> 0:18:50.800
Joseph Elliott
Yep.

0:18:50.300 --> 0:18:55.850
Interviewee B
And so I think that that is a barrier. It's a, cultural thing.

0:18:56.990 --> 0:18:58.10
Joseph Elliott
And you think that's over a personality basis or like think it's an individual thing through normalization. Or do you think like for example you think it's more than organizational thing that can change holistically or is it that there's just a number of people?

0:19:17.950 --> 0:19:20.540
Interviewee B
I think most cultural barriers.

0:19:21.190 --> 0:19:52.20
Interviewee B
Could be easily mitigated if you had a strong pilot that demonstrated the value and the training plan in place, because quite often it's a subjective view on the implementation of technology and there's no training course. You can have a barrier because people don't like change and you're making it very hard for them. So I yeah, I think there is an organizational approach that could that could fix that. I think you're still gonna have some degree of reluctance because people were inherently don't like change, but in reality you could make it a lot easier for them.

0:19:52.470 --> 0:19:55.250
Interviewee B
And then then I think we do because it's just its not well considered when we come to rolling out technology, I would suggest.

0:20:3.10 --> 0:20:3.330
Joseph Elliott
Yeah.

0:20:8.70 --> 0:20:18.20
Joseph Elliott
So you pretty much answered this, but if you were given a new technology now, what methods would you use to try and adopt it as successfully as possible?

0:20:18.90 --> 0:20:28.650
Interviewee B
it goes back. I mean, I think there's good examples in other industries for how you should look at identifying where weaknesses or problems are, assess what your solutions could be.

0:20:29.450 --> 0:20:29.780
Joseph Elliott
Yep.

0:20:29.710 --> 0:20:40.800
Interviewee B
Pick the right one to fix the problem and then make sure that there's an education and training piece rolled out that will ensure that it's adopted and implemented to full effect.

0:20:41.440 --> 0:20:49.690
Interviewee B
We just, you know, we tick none of those boxes. In reality, we go ooh shiny laser scanner, that would be good. That looks like a land value. And then you know, people don't understand it. They, you know, and they fall back on what they do understand. So yeah, it would definitely just be a, got to be more considered in terms of approach.

0:21:2.860 --> 0:21:3.860
Interviewee B
And got a top down support, no implementation is gonna be successful if you haven't got a push from the top to enforce it on, because you're always gonna have that little bit of barrier at the end regardless of how well you implement it. And that's going to require someone further up the food chain to poke people in the right direction and get over that final hurdle, I think.

0:21:25.0 --> 0:21:25.380
Joseph Elliott
Yeah.

0:21:33.350 --> 0:21:47.80
Joseph Elliott
So as well as the training, if you go back a step, sort of the communication piece and everything like that, would that be where you'd look to impose something like a pilot and then release the the findings or?

0:21:47.420 --> 0:21:56.170
Interviewee B
So yeah, I mean if you take the steps you've got identify the problem, you've got select the right solution, whatever technology that might be.

0:22:2.290 --> 0:22:21.670
Interviewee B
You've then got pilot it and that, and that's in the true sense, you know, that isn't you're trying to avoid putting the project at risk because whenever you introduce something new, there is a risk. So. So you've gotta select the right project to highlight it on with measurables. Objective measurables of success once you've got that in place, then take a step back and look at an implementation plan. If it's the right thing to do, don't you?.

0:22:28.820 --> 0:22:59.320
Interviewee B
And and then part of that will be an education. So you know, in terms of overcoming those barriers, it will be actually if if you want this to succeed, you need people to understand why we're doing it will be the first thing, aside from how they're gonna do it, what is gonna change the part of their role, the why you're doing it in the 1st place is critical because if they understand why you're doing it and agree with it, then straight away your barrier starts to come down and then you roll into the education. Sorry, the training piece where you teach them how they need to do what they need to do differently.

0:23:0.90 --> 0:23:2.350
Interviewee B
To make it a success. So yeah, I think.

0:23:7.630 --> 0:23:8.100
Joseph Elliott
Yeah.

0:23:3.680 --> 0:23:10.510
Interviewee B
Yeah. All those steps kind of would be great if we done that, but just rarely happens.

0:23:8.890 --> 0:23:12.320
Joseph Elliott
Also, if you have an issue in that If people understand how it's useful but you don't understand the reasons behind doing it.

0:23:19.260 --> 0:23:20.420
Interviewee B
Yeah, exactly that.

0:23:24.520 --> 0:23:34.510
Joseph Elliott
So if you were to give advice to another contractor working in retail, what 3 tips would you give them for implementing a new technology?

0:23:34.630 --> 0:24:2.980
Interviewee B
I think it just goes back to what we said before. I mean, I think you only wanna do it if you're if

you've identified a problem that the technology is fixing or improving on. I think you've got a plan for the pilot and the measurements that you're gonna take in terms of whether it was a success or a failure. And then I think you've got to come away with an implementation plan that involves an education on why you're doing it and the training on how to do it. I think if you can do those three things then.

0:24:3.650 --> 0:24:5.390
Interviewee B
I think it would be more of a success.

0:24:6.200 --> 0:24:6.470
Joseph Elliott
Yep.

0:24:6.220 --> 0:24:8.630
Interviewee B
More often than not, which at the moment I would say. Don't get me wrong, there's loads of value in what we do, but you know, it's not as big as it should be when we implement something.

0:24:17.790 --> 0:24:19.280
Interviewee B
Because we don't tick all those boxes.

0:24:19.870 --> 0:24:32.450
Joseph Elliott
Yeah, it's almost just a. Here's a bit of tech. Go away and use it, and yeah. And you haven't seen all of these working about beforehand. If you haven't been involved in them more sensitive than it's difficult to then get behind it.

0:24:32.720 --> 0:24:34.150
Interviewee B
Yeah, absolutely.

0:24:55.100 --> 0:24:55.810
Interviewee B
Good. Yeah, yeah.

0:24:39.850 --> 0:25:2.560
Joseph Elliott
And then the final one really is just bit open to you. If there's anything else that you think is important on the topic of sort of technology adoption in retail and if there's any sort of research or ongoing developments or anything you're interested in or working on that you think would be a good thing to include or look up?

0:25:3.780 --> 0:25:11.590
Interviewee B
Yeah, I got nothing on anything ongoing research papers or the like, I'm afraid. But I think all too often. We fall back on technology to fix problems that are process problems and I think a not a lot of the time. Certainly at least some of the time, we think technology's gonna fix a problem that it's just a it is a business process problem, so.

0:25:33.890 --> 0:25:53.760
Interviewee B
Yeah, standard operating procedures, you know, normal ways of doing the things that become consistent. I think there's loads of opportunity with very little investment to understand processes and fixed processes that would add far bigger return on the investment than

potentially technology would. So I think and again technology works better when it's fitting into process and maybe that's part of the problem.

0:26:1.900 --> 0:26:28.730
Joseph Elliott
Yeah, it's interesting you said that, but I think the one thing, the one key take away off taking what you've mentioned quite a few times about identifying the problem. And if you haven't identified that something that's key one, you know, you say that we try and get technology to fix process problem, but take a step back if you've identified what the problem is and the solution not necessarily always a new technology as the way to go forward.

0:26:29.210 --> 0:26:38.180
Interviewee B
I think if business is understood, the processes they went through, but they could document them then they're probably more easily be able to identify the area where technology could help.

0:26:38.430 --> 0:26:54.50
Interviewee B
And like. Yeah. So. So I think you know, you're gonna fix good foundations. You wanna get what? What does the business need in terms of steps, processes, activities in place that need to be undertaken and then would they be quicker or better if a technology was implemented to facilitate them.

0:26:54.540 --> 0:27:1.930
Interviewee B
And you know, sometimes it won't be fixed straight away. You can even write off looking for a technology solution. But yeah, I think it goes back good foundation in terms of process standard operating procedures technology.

0:27:10.900 --> 0:27:16.510
Interviewee B
You'll be able to identify far easier. where technology will help if you understand your business process is better.

0:27:22.740 --> 0:27:26.120
Joseph Elliott
No, that's that's pretty spot on. I think you're quite right. Quite a lot to get away with them and start looking at them.

0:27:31.580 --> 0:27:34.700
Interviewee B
How many of these interviews have you managed to line up just out of curiosity?

0:27:33.760 --> 0:27:41.780
Joseph Elliott
Ohh, I'd only done one at the minute. Then you have got three more lined up waiting on a couple more to come back.

0:27:45.140 --> 0:28:15.570
Joseph Elliott
Yeah, be interesting. You know this. It's quite it's quite interesting seeing difference in where people sit as well in the business, compared to their answers that I've done. Commercial manager who you know the whole thing is just about how much it costs and if it costs too much. We're not implementing it sort of thing, whereas yours is a lot more interested in terms of you started it off by saying, you know the funding is there especially compared to like consultants, and then it's all the other bits. So that's gonna give quite a bit of a interesting view.

0:28:16.800 --> 0:28:18.990
Interviewee B
Absolutely. That's so that it, there's an education piece, though, because commercially, if I was sat there and someone had done identified a problem, found a technology that improves the situation, then yes, you it might cost you half £1,000,000 to implement. But if it saves you 100 grand per job, you've only got to deliver 5 jobs before your break even, and then you're saving money from that point forward. So looking at the return on investment rather than the outlay, it's probably a more sensible. So again, it's just an education piece and ensuring you get your process right, yeah.

0:28:50.700 --> 0:29:9.710
Joseph Elliott
Yeah, yeah, it seems to be all around this will be upfront work and like, like you said few times it's the difference between this bit of technology now to try and implement it through a business or actually identify and working out where it fits in, training people and do we know the right structured way.

0:29:10.470 --> 0:29:24.580
Interviewee B
But which in itself is gonna take a little bit more investment because you got some upfront to do, but actually rather than only seeing 10% of you possible value of that you might be seeing 90% of the value of implementing it effectively. So again with everything considered in the round, you're far better off.

0:29:26.160 --> 0:29:41.570
Interviewee B
Doing the upfront work and then implementing technology that's actually gonna improve your business rather than go and there's something shiny and new, I'm gonna buy that and we pop. Ohh, it didn't really add any value. I knew it wouldn't be any good. That's the kind of usual steps we take. So yeah, so.

0:29:41.690 --> 0:30:2.400
Joseph Elliott
Yeah, I think that's that's where you need someone that's impartial. Where I don't think we'd necessarily get that new. You go out to the market and think you've got an issue and you're immediately just being presented by myself, people that you know here's the solution. Here's the solution, but not necessarily people like say, I'm impartial. Actually look at the problem first.

0:30:2.920 --> 0:30:4.250
Interviewee B
Yes, absolutely.

0:30:5.620 --> 0:30:19.750
Joseph Elliott
No, this is a been very interesting and yeah, thank you so much for your time. Really appreciate it. well, pretty much hit the time and bang on there as well. So I'll let you get on with you afternoon.

0:30:19.800 --> 0:30:20.310
Interviewee B
Cheers, yeah.

No problem at all

0:30:22.120 --> 0:30:24.560
Interviewee B
No worries, Joe. Alright, speak soon. Bye.

0:30:20.750 --> 0:30:24.760
Joseph Elliott
Yeah, cheers for that. Really appreciate it. Catch you later. Bye.

10.6. APPENDIX F

INTERVIEW C – TRANSCRIPT

11th August 2022	32min, 28sec

(NOTE; Introductions and description of research topic and focus was discussed prior to transcript starting)

0:0:0.0 --> 0:0:10.320
Joseph Elliott
Afternoon, I'm just going to start the transcript now. If it comes up on yours, but on mine it just comes up on the right hand side. So you start seeing all of the words that you're saying. It gets a few of them wrong, but it's a lot easier than typing it all up.

0:0:8.580 --> 0:0:21.710
Interviewee C
That's ok. Yeah. No, I got notification. I got notification this end and that's ok. I'm sat in a Costa Coffee, so you get an order for a flat white or something cut it in there. that's why it's a little bit of background noise. But yeah, it should work, right?

0:0:22.670 --> 0:0:42.180
Joseph Elliott
No, that's alright. I'll get started with some of the questions then. So the first one really is just have you ever experienced the implementation or adoption of a new technology within your role and if you have, what do you think are the main positives and negatives of that actual implementation?

0:0:43.470 --> 0:1:1.320
Interviewee C
yeah, great. Great question. So absolutely, yeah, my role is about implementing a new technology and process behind it, which is DFMA within our logistics and distribution business and spilling over into retail as like **** clients and some of those accounts.

0:1:1.450 --> 0:1:17.250
Interviewee C
Umm, the positives behind it are very much risk elimination, quality improvements, speed of delivery and net zero carbon delivery. So delivery for our clients and for us. You know those kind of benefits.

0:1:23.990 --> 0:1:24.190
Joseph Elliott
Yeah.

0:1:18.950 --> 0:1:36.50
Interviewee C
Challenges and or negatives on this are like, the biggest challenges around it it's very much what I suspect you'll find out although, its down to what we've got, the people in process and we've got the processing technology. Where its already in place that's there ready to use, but it's cultural adoption and the people aspect of it.

0:1:37.130 --> 0:1:57.40
Interviewee C
That's gonna be the challenge around this as we've other technologies implemented in construction and that's not a negative, in terms of people are saying I don't wanna do it, it's a training requirement and it's up to us to help people adopt it and use it and get the best out of it. It's a training requirement and a transformation, a digital transformation is needed.

0:1:58.700 --> 0:2:10.650
Joseph Elliott
No that interesting. Yeah, like you say. That's pretty much the big one that I'm finding is the culture, especially in retail as well. It seems to be one of the biggest blockers.

0:2:11.470 --> 0:2:13.20
Interviewee C
Yeah. Yeah, I thought so.

0:2:13.980 --> 0:2:22.820
Joseph Elliott
So when looking at a technology, what would you believe is the key SuccessFactors for actually, you know, successful adoption or implementation?

0:2:24.470 --> 0:2:27.800
Interviewee C
And so if you're implementing an on off the shelf product.

0:2:28.980 --> 0:2:59.990
Interviewee C
Then it's kind of finding a use case for it early on and doing a test sample for users. Is it easy to use? Can you apply it to your job? Do you know which literally which buttons do you press to make it work and you work that out as if the UI mean interface of it? If it's a software for example, or an easy to use, it's a piece of hardware like a drone that scanning for example, or a robotic service hole driller. Is it easy to use and press the buttons within the hardware itself?.

0:3:0.270 --> 0:3:23.440
Interviewee C
So user interaction with the technology is key. If you're building a piece of technology from scratch or building your own one like a power BI calculator tool or something like that. It's designing it from the outset so that it's easy to use and you're gonna roll out the people. Yeah. So front loading the process with spending a bit time front loading it, you're rushing to get it out, spending a bit of time looking at user interaction.

0:3:33.260 --> 0:3:33.510
Joseph Elliott
Yeah.

0:3:24.640 --> 0:3:34.240
Interviewee C
User experience, you know user journey. What makes it gonna make it successful. So you're not getting called daily with. How do I use this? What does they do? It is key.

0:3:36.400 --> 0:3:36.690
Joseph Elliott
Yeah.

0:3:38.590 --> 0:3:38.900
Joseph Elliott
makes Sense.

0:3:41.280 --> 0:3:47.950
Joseph Elliott
And is that is that once it's implemented or is that through the process of trying to implement it as well?

0:3:47.530 --> 0:4:17.450
Interviewee C

That's, that's the process of implementing it, you know, trying to inflate it from the outset. So it's project inception level, but it's also once you've got a piece of technology like that running in a business, you can't just sail off into the sunset and leave, it needs maintenance and support in some degree. Now maintenance may not be bug fixing a piece of software that may be down. So if you've got an off the shelf piece, the company will do that for you as a support agreement, but it's maintenance is as much as people training side of it. They've issued version 2 of the Software. Some of the buttons are in different places.

0:4:20.430 --> 0:4:20.620
Joseph Elliott
Yeah.

0:4:20.200 --> 0:4:26.10
Interviewee C
Uh, so it needs. You need a training set, training slides and update. You know how it works again.
And you know regular sort talks or talks like and how to use it.

0:4:31.250 --> 0:4:31.530
Joseph Elliott
Yeah.

0:4:37.130 --> 0:4:56.820
Joseph Elliott
Do you believe that there's any specific factors when looking in retail construction that might be different or you know more of a challenge than in other sectors of UK construction? Is there anything like specifically that you know working in retail it's harder or different?

0:4:56.970 --> 0:5:4.580
Interviewee C
Yeah, Ive worked for retail for six months now. Eight months now, actually since January and it's the first time I've really worked in the sector I've worked.

0:5:8.340 --> 0:5:8.630
Joseph Elliott
Yes.

0:5:5.790 --> 0:5:31.600
Interviewee C
You know, you know kind of more like the construction side of the business before for Wilmot Dixon and some other companies and consultants. And my experience are retail. So far has been, it is fast. It was rapid because the client wants it yesterday. That's the nature of the sector. So the speed of delivery is much faster, you know, I'm sorry, it's faster before, but much, much faster. So the decision making needs to be quicker or….

0:5:32.410 --> 0:5:52.410
Interviewee C
You've got, you know, a standardized, repeatable approach up front, which is very much for DFMA comes in. So you already know what the answer is. So as you get the tender in rather than reinventing the wheel and having every building on every product being a prototype each time. So I would say from retail specifically, in my experience, if I've been speed of delivery and client expectation for that speed.

0:5:53.160 --> 0:5:53.420
Joseph Elliott
Yeah.

0:6:0.260 --> 0:6:11.330
Joseph Elliott
So, next is one of the key SuccessFactors, but also the barriers. So when trying to adopt all of this, what do you think of some of the big barriers that you're facing?

0:6:14.460 --> 0:6:43.350
Interviewee C
Sorry my experience so far, I think you know whenever break a project down in a BIM manager. And so I think maybe technology there. But feeding into this role is very similar to kind of break up project down when I've done it into three factors which is kind of why I mentioned earlier you know people process and technology PPT and if you imagine those three circles you ven diagram thing with the three circles overlaps as a Venn diagram and successful adoption and stuff project is for the overlap in the middle with those three circles overlap.

0:6:44.610 --> 0:6:44.910
Joseph Elliott
Yep.

0:6:43.690 --> 0:6:48.500
Interviewee C
So I think process for this project in this role and within retail.

0:6:49.820 --> 0:7:0.230
Interviewee C
Process has been, you know, take a little bit of thought to map out, but it's been fairly easy to kind of see what we need to do technology. There's been a little bit of a challenge around.

0:7:1.500 --> 0:7:6.70
Interviewee C
Getting the support for my team and the adoption of technology that's needed maybe.

0:7:6.410 --> 0:7:6.940
Joseph Elliott
OK.

0:7:7.390 --> 0:7:16.930
Interviewee C
And a journey there to help people understand, but for sure, kind of what we've already mentioned around the main challenge being cultural adoption of the idea of the need for it.

0:7:17.190 --> 0:7:21.560
Interviewee C
Umm. And the cultural usage of it in a day-to-day job.

0:7:22.800 --> 0:7:32.670
Joseph Elliott
And from your experience like working with the sort of the bigger construction side of things. If you think that it's the cultures different in the retail side of it?

0:7:36.40 --> 0:7:48.90
Interviewee C
I haven't found it that much different to, you know, from my construction inside the business of data and I have to say, I mean it's kind of a, it can be an office thing or regional thing.

0:7:53.140 --> 0:8:9.980
Interviewee C
I wouldn't say it's particularly that much different from what my experience has been so far. The only constraint is the pace of delivery, which is what i kind of mentioned there and that does

make the culture, but they're along the lines of I've got time to do it needs to be done, just get it out there, just give cross plan out.

0:8:10.90 --> 0:8:10.380
Joseph Elliott
Yeah.

0:8:11.400 --> 0:8:17.890
Interviewee C
So the speed, I suppose delivering itself is part of the culture. So that's the only thing I've found.

0:8:18.310 --> 0:8:19.600
Joseph Elliott
Yeah, that's interesting.

0:8:20.290 --> 0:8:29.440
Interviewee C
And that's what pressure, I suppose there's always pressure to deliver. Always pressure on programme on time scales. But it is it is super fast in, you know, especially retail and warehouses.

0:8:31.0 --> 0:8:31.340
Joseph Elliott
Yeah.
I understand that.

0:8:35.190 --> 0:8:37.460
Interviewee C
Yeah, I bet you do. I bet you don't need to tell you that one.

0:8:40.320 --> 0:9:3.330
Joseph Elliott
Then the next one. So if you were presented with a new technology, what methods would you use to make sure that it's implemented successfully? But suppose you can go with what are you doing at the moment and you know what, what are your sort of targets and how you're trying to get this through successfully?

0:9:5.90 --> 0:9:28.660
Interviewee C
Alright, so we got we vote from the first things I did when I joined the company was to write DFMA delivery strategy but that has now been published and that's got three-year time scale for delivery with key kind of task drops programmed in mostly from the front end process of building the digital tools to go with it. So we've got some Revit based Dynamo kind of scripting based tools and the power BI calculator. It plugs in so.

0:9:31.250 --> 0:9:49.860
Interviewee C
And out of that paper I calculate it kind of gives you a project specific report. Your DFMA measures and you produce PDF like a locked PDF with project overview and what you need to deliver. I can show you this on screen a little bit so my deliverables are supposed and kind of adoption for people when communicating it. It's a mixture because people just wanna cup of coffee in the kitchen and talk through it in and then pull environment. So the way people adopt stuff and engage with it is different and you've almost have those sort each person out, if you like from the outset.

0:10:19.880 --> 0:10:31.230
Interviewee C
So you have to identify the key stakeholders are and what they're sort of method of adoption

and engage with might be if you say I'm gonna do a presentation on it on Tuesday afternoon at 3:00 o'clock can you spare an hour to do it?

0:10:34.890 --> 0:10:35.150
Joseph Elliott
Yep.

0:10:32.290 --> 0:10:49.740
Interviewee C
Ohh, people funnily have me turn up and I figured out how they do that time. But Not interested. It's not from there. They're the people. You might just give a PDF and they'll like one page and they'll scan through it. So you can't know what to identify your stakeholders and the way they engage and the way they learn all the information and that is a step by step process thinking it out.

0:10:55.230 --> 0:10:55.600
Joseph Elliott
Yes.

0:10:56.120 --> 0:11:0.790
Interviewee C
And there's no smart or fast answer to that. But other than recognizing people learning different ways.

0:11:2.170 --> 0:11:2.450
Joseph Elliott
Yeah.

0:11:3.600 --> 0:11:10.630
Joseph Elliott
Now it's interesting you said that one of the big things that I'm hearing from people is, you know, when it's when it's then rolled out people have different opinions of it and it's not exactly what you said, just an e-mail with here's the instructions how to use it is fine for some people, for people will just not intentionally, but will almost ignore that because that's not how they wanna see it. They wanna see and hold it and do it that way. So yeah.

0:11:30.470 --> 0:11:31.340
Interviewee C
Absolutely.

0:11:31.420 --> 0:11:56.550
Interviewee C
That's where you almost have that suite of different kind of communication tools, if you're like, you know one page of PDF more in depth PDF with some graphics and graphs and it may be power BI cell charts, some people just wanna word Doc you know, some people may want to slide deck and you have to sort of a folder with all those different ways saying the same thing, presenting it and then you pick and mix what it is for the person you're in the state of your communicating with.

0:11:57.440 --> 0:11:57.770
Joseph Elliott
Yeah.

0:12:2.70 --> 0:12:18.450
Joseph Elliott
And typically, who are the key stakeholders you know, is it people within the organization you know and all the more senior role or can it vary between sort of from senior right down to site level.

0:12:19.780 --> 0:12:29.740
Interviewee C
Taken as it's all the way down with discovering it's all the way down. So from senior level it's the front end of selling the idea to the client if you should need to be sold. But selling the idea to the client.

0:12:48.190 --> 0:12:48.430
Joseph Elliott
Yes.

0:12:31.610 --> 0:12:54.690
Interviewee C
As is the case, some clients you know the client wants to do it and we need to sell them. Yes, we've got this capability developing capability. We can do it rather than just sort of trying to get around it when it comes up in a meetings. So saying you know the business development front end side of it up front, maybe for more senior staff. So we've got this capability. We could produce a DFMA tailored report for each project at stage one or stage 2.

0:12:54.770 --> 0:12:59.740
Interviewee C
It's all the way down to the the process of actually delivering it on site to.

0:13:1.40 --> 0:13:6.670
Interviewee C
To the guys and even subcontractors. You know, taking a prefinished full panel in a bathroom.

0:13:7.110 --> 0:13:27.70
Interviewee C
Umm so we not having to do wet trades and tiling and putting the two fixes from top to fixings in the bottom and the flanking strip along the top and being engaged that process and knowing why we're doing it. So it is a complete nose to tail process with design if this is development design and delivery stakeholders along the path.

0:13:27.620 --> 0:13:40.480
Joseph Elliott
Yes, it's pretty much everyone. It's quite interesting what you say about the client. So obviously with this scenario, the client isn't the driver, but they're one of the key stakeholders. Is that right?

0:13:41.160 --> 0:13:45.100
Interviewee C
And they couldn't actually. Actually, the client is the driver in many cases.

0:13:54.320 --> 0:13:54.760
Joseph Elliott
Yeah.

0:13:45.760 --> 0:13:55.430
Interviewee C
So if you take you know we work for an American logistics fulfillment company beginning with we probably both had a pass from today.

0:13:55.500 --> 0:13:55.800
Interviewee C
It's them very much for pushing it and it is them saying what you doing about it.

0:14:2.170 --> 0:14:2.430
Joseph Elliott
Right.

0:14:2.780 --> 0:14:13.700
Interviewee C
So that and that was one of the drivers to me being recruited in the 1st place. And I mean there's a recognition in the business we need to do something about it and the whole group central MMC push very much overlaps with them.

0:14:14.780 --> 0:14:18.430
Interviewee C
DFMA might be different than it's much more design process that lead.

0:14:18.840 --> 0:14:28.820
Interviewee C
Uh, and I almost promised to talk with the delivery of MMC, but it's big overlap there, so the big group push for, some pushing for it because they realized the benefit of it.

0:14:29.290 --> 0:14:29.740
Joseph Elliott
Yeah.

0:14:30.140 --> 0:14:42.670
Interviewee C
And especially if you take a big shed, it's a basically a big Lego kit anyway, made of components. There's very little bespoke wet trades in there, so it lends itself to it nicely, which I think helps.

0:14:42.850 --> 0:14:55.340
Interviewee C
So they probably realize themselves and it's rubbing up in our other clients as well. Now they say no, but they're doing it. Are we doing it as well and if not, why not? That is partly component driven.

0:14:56.220 --> 0:15:9.10
Joseph Elliott
There was the mindset from them to see an output and see a benefit. You know they sort of given a right I want you to implement this but we wanna see the benefit you know very quickly something.

0:15:8.250 --> 0:15:30.160
Interviewee C
Absolutely. Yeah. So there is a drive and a demand from them to see certainly within certain parts of the business and the company I mentioned, obviously very big. So I don't know, you're dealing with the client, but not the left hand isn't always talk to the right. So it's not a complete. We want IT company mandate but there are people influence people within the business pushing for it and want to see it happening.

0:15:31.790 --> 0:15:36.530
Interviewee C
And yeah, that's part of the driver for us. So it's partly client driven.

0:15:37.550 --> 0:15:43.540
Joseph Elliott
OK. And which would you say that that changes the way that you're approaching it slightly?

0:15:44.780 --> 0:15:58.30
Joseph Elliott
Sort of. If there wasn't an external demand or stakeholders, one like say, the client, would things you know go a little bit slower internally, would you, you know, refine things in this tool?

0:15:56.690 --> 0:16:18.580
Interviewee C
I think a client. Yeah. I think that's definitely client drives speed this process up. I think there is a realization within the business we need to do something about it and the investment in the US and kind of that's what MMC which as I say very much overlaps with this shows you that there's a realization that we need to do something about it as a company to sell ourselves to our clients.

0:16:20.260 --> 0:16:25.690
Interviewee C
But it is partly client driven as well and I think that has speed it up differently.

0:16:26.950 --> 0:16:30.550
Interviewee C
Much as you kind of related to at the beginning there, retail works pretty slowly so I suspect we're probably at the stage now where we've got people, involves build right strategies and delivering on projects, whereas if it wasn't client driven, it'd probably be discussed at meetings and that's probably it's far as it would have gone.

0:16:42.770 --> 0:16:58.360
Joseph Elliott
Yeah. I'll find out few of those situations where we go. This is a great idea. We're gonna do it. We even tell people we're in it. And then your almost years down the line and you don't actually see anything come out of it. So yeah.

0:16:57.790 --> 0:16:59.450
Interviewee C
Let's say and if you and if you look at competitors, you know the likes of Mace and Langs team, have been doing this for a while, but in production capability in some cases was slightly different business to them. It's slightly different sectors, but they've got their own specialists in this area and have had for a while, in some cases in production. So they're vertically integrated production could delete to make their own products, own precast concrete for example. So it's almost becoming a case of this with a lot of things that you're not going to be a leader, you're doing it to keep up and to be able to tender against them and be on a level playing field.

0:17:37.190 --> 0:17:39.280
Joseph Elliott
Interesting. It's been not something that you know, as a company will start to do, to push more generally. Suppose again try and sort of think more specifically in the retail sector or is it something that it's gonna be you know, trying it, as you say, trying to keep up rather than trying a lead.

0:18:0.270 --> 0:18:2.680
Interviewee C
Yeah, and a lot. You'll see a little bit there, I think that’s the questions so that if I don't answer, I think so. I think it will be pushed in that way. And I think one of the transactions, which is something.

0:18:18.750 --> 0:18:18.990
Joseph Elliott
Yeah.

0:18:13.560 --> 0:18:43.610
Interviewee C
Going on a couple years ago and I think the kind of warming back up again to the idea of platforms and platform DFMA, which Im not sure if you're familiar with, but essentially it's the idea of using reusable parts and elements across multiple projects, multiple different projects. So if you take a bathroom pod, for example, an ESS is investment. There's a good example of this. If we've got a schools view Department for Education projects to deliver out, we've got other projects to deliver and we've got load of art forms.

0:18:51.130 --> 0:18:51.390
Joseph Elliott
Yes.

0:18:47.210 --> 0:19:13.310
Interviewee C
You know the spec in those might be, you know, the state where they might slightly differ but the ultimate spec and size them is can be very similar. So if you've got all those projects across a company as a group and you could put in a bulk order on a production line with to make a couple hundred of them and they're gonna get spread across different projects at the same time. That's what your real economies of scaled come from and it might be your deliverables on site are put in but someone runs around and puts a different spec,.

0:19:14.70 --> 0:19:14.400
Joseph Elliott
Yeah.

0:19:15.360 --> 0:19:30.310
Interviewee C
But yeah, that idea of platforms, I think and economies of scale that can come from it and one of the reasons why we tested it in ESS is what's gonna push that.

0:19:33.130 --> 0:19:51.760
Joseph Elliott
That that makes sense. Yeah. It it's definitely something that, you know has come up quite a lot of my literature review, one of the key ways to sort of improve productivity really and efficiencies is that sort of economy of scale and offsite production or cloud application.

0:19:52.910 --> 0:19:55.220
Interviewee C
I agre and also front loading the process so.

0:19:56.360 --> 0:20:7.420
Interviewee C
If I share my screen quickly, I'll show you the DFMA, process we're using. If you can see, hopefully you can see that.

0:20:7.500 --> 0:20:8.470
Joseph Elliott
Yep. Yeah I can.

0:20:7.880 --> 0:20:38.490
Interviewee C
Ohh so this is our document for my workflow that we're implementing. I'm implementing the editorial way and very much you know where folks on this front end process of assisting component library. They're kind of white label components in Revit non branded at the moment. You've got the central DFMS file chains that support from our own optimization tools based around Power BI and Revit and client requirements that might be net zero or it might be quick, dirty and cheap speed of build. It might be a specific spec for something.

0:20:48.660 --> 0:20:48.870
Joseph Elliott
Yeah.

0:20:38.760 --> 0:21:9.110
Interviewee C
This front end process got lots put into it and get these builds of it to process it. Then you know so we're compressing stage four. And the plan is to compress stage four anyway, rather than doing a traditional getting here and going hey should we do DFMA or MMC and the reason we can compress that is because we're reusing components, reusing design information, reusing node interfaces between different parts of a building each time and front loading that process is the key you know absolutely important part of doing that.

0:21:9.190 --> 0:21:18.360
Interviewee C
Again, this is where I get the stakeholders. I'll talk about stakeholders throughout the process, but these stakeholders are actually key because the whole thing I've rambled one, buying it, you don't do that.

0:21:19.70 --> 0:21:27.280
Joseph Elliott
Yeah. You, almost have to have all the structure there, all the skeleton and bones of the project all ready to go so that you can then get the efficiencies.

0:21:26.360 --> 0:21:27.520
Interviewee C
That's that's it.

But if these components, you know we're using the same plot bathrooms each time or MEP rafts, you know, prefab get MEP rafts each time. We've only got bulk ordering through platforms, but we know how they come together. We've done it before. The site managers know how it goes together. It's the site managers know how it goes together, but comfortable with it. That means this stage becomes a lot more compressed and other stage can eventually start to compress a bit as well because it's a known quantity. You've laid the tracks, you just back it up and drive down again.

0:21:57.380 --> 0:22:17.590
Joseph Elliott
Now that makes sense because that's another thing that, you know, especially in the design element, the stage for, you know, the technical design is something that we do tend to almost start from scratch on a project, even though we've done very similar. you know, two months beforehand. But it just needs tweaking, And it's definitely not efficient.

0:22:15.640 --> 0:22:26.260
Interviewee C
That's it. Even to the stage of getting a stage two or three model from an architect and. you know, maybe an early stage MEP model and scrapping it and starting the modeling again. Just, just just complete madness.

0:22:42.610 --> 0:22:43.830
Joseph Elliott
Yeah, that's yeah.

0:22:30.230 --> 0:22:47.560
Interviewee C

For example working this project first when we could be utilising with reusable bits of Revit. You know components and running the whole thing through a one stop sharing there. But just to

give you a flavor of what I'm working on, this is my strategy and what I'm building these building blocks and bits and pieces put those in place.

0:22:51.680 --> 0:22:52.730
Joseph Elliott
That's really interesting.

0:22:58.170 --> 0:23:9.380
Joseph Elliott
Yeah, let's say this. There's a lot ongoing at the minute, so sort of literature of doing stuff and seeing it in theory. So it's nice to know that it is actually coming together.

0:23:10.550 --> 0:23:22.160
Interviewee C
Just starting to roll out now. So second time to get that strategy into players like I said and kind of the digital tools to build a block into place, but just start to roll out and offer few projects now. So yeah, it's just like it's come to fruition.

0:23:24.310 --> 0:23:29.170
Joseph Elliott
I've got I think I've got pretty much a one or two more questions. I'll probably run through those.

0:23:31.420 --> 0:23:46.390
Joseph Elliott
So this next one is, if you were to give advice to another contractor working in the retail sector, what 3 tips would you give them to implement a new technology successfully?

0:23:49.100 --> 0:23:53.710
Interviewee C
I would say people, people, people or training, training, training. However, you wanna phrase that.

0:23:56.90 --> 0:23:57.500
Interviewee C
Pop down engagement and buy in.
It's gotta be top down and buy into the idea. You wanna threaten you and yeah, well, obviously develop your strategy. So a front end strategy, that's how the process maps out on how you're gonna deliver this obvious one, but it's true.

0:24:16.790 --> 0:24:27.710
Interviewee C
Don't be in a rush to get there because our competitors are doing it, or there's technology out there, or say OK but do it too quick, becasue we need to do it just because we need to do a tender interviews and say we're doing it.

0:24:28.780 --> 0:24:53.730
Interviewee C
Take your time to map it out because you know you've got one shot, probably culturally, at getting people on board with it and the digital transformation comes with it and when it's done badly and it's rushed into and it's, you know, it goes wrong in a project. It is a load of money or you're dragging people through a load of the slides that just don't make sense in training sessions. You've lost people that's in it and that terminology.

0:24:59.20 --> 0:24:59.200
Joseph Elliott
Yeah.

0:24:54.450 --> 0:25:2.730
Interviewee C
because then for things such as MMC there almost becomes a toxic name and idea within a business and people won't touch it.

0:25:4.700 --> 0:25:19.830
Joseph Elliott
And that's a really interesting point that one shot culturally is it's got key thing it's, you know, even to a point, especially in what we do, where it's, you know, fast, quick projects that don't necessarily have the upfront information.

0:25:24.580 --> 0:25:24.950
Interviewee C
Yes.

0:25:20.970 --> 0:25:42.470
Joseph Elliott
Yeah, the word BIM was thrown about so much, but actually all we're talking about is a 3D model because we don't use anything else in there. So people act like, now you say the word them and they go. Ohh. I'd hate that. And actually you've never used it. You never worked on a project with it properly. You're what you're talking about is the designers using a 3D model. That's it.

0:25:43.170 --> 0:26:0.380
Interviewee C
Yes, that's it. That is exactly it as a recovery. And I did manage myself, I could tell I've experienced that so many times. So you barely scratched the surface of the capability here, but because you've already decided in your head and this is again, this is not criticism, this is a training and culture thing for those three letters mean this to you, you've lost them.

0:26:6.800 --> 0:26:7.200
Joseph Elliott
Yeah.

0:26:2.20 --> 0:26:11.350
Interviewee C
And you almost have to come up with a rebrand. and come up with another name to implement it, albeit as a as basically the same thing.

0:26:19.0 --> 0:26:19.390
Joseph Elliott
Yeah.

0:26:15.640 --> 0:26:23.610
Interviewee C

Sorry just to elaborate on that point, always using them as an example, BIMs been around for 10-15 years experience and its that very much the sort of reaction that they you're talking about, then almost to the point where BIMs actually being rebranded now as information management or I think we've just changed all our BIM management to decision construction managers now. Part of that is a recognization that is more than being it's BIM plus now. But I actually want to think part of that is people really want to commit to it, its a rebranding to a clean slate and start again exercise.

0:26:49.530 --> 0:26:50.0
Joseph Elliott
Yes.

0:26:50.490 --> 0:26:58.420
Interviewee C
And in terms of paper dumping, Everyone's kind of had an update and sick of it. Let's rebrand it. But it's very much a similar thing.

0:26:58.880 --> 0:27:0.950
Interviewee C
Umm. Anyway, sorry you lost. Question was.

0:27:1.350 --> 0:27:31.30
Joseph Elliott
Alright. Yeah. No, I completely see that 100%. You know now when you say BIM, people like the people that know it will be exactly what you say the ones to quickly correct you and say no, no, no, it's not BIM. That's not what we're doing, but people that don't like say I think the general consensus is it's a waste of time or this. But actually nobody really uses it properly or hasn't been doing. So I can see all of that through not just the company, but quite a bit through the sector.

0:27:35.950 --> 0:27:56.860
Joseph Elliott
So then finally, really it's just, is there anything else that you think on the topic is important that you just wanna share and if there's any sort of, you know, research or anything out there at the minute that you think it's quite interesting that you think I should go and have a look at or any people or anything that you would suggest reaching out to?

0:27:57.90 --> 0:28:25.500
Interviewee C
There's absolutely tons with. I was gonna point you towards 3 documents. I would say look at the ‘construction innovation hub’ who are in the kind of governments mouthpiece. If you haven't looked at their documentation, definitely do the platform. We're all work specifically have a look at that, that is brilliant and presented really well. There's a great graphic in there around trainers and sneakers and like Vans basically, and how vans all based off the same platform literally platform even like sold. But you make so many different shoes on top of it and so many different products habits and often fill a whole company and whole shot with anyway. So that platform rulebooks really worth a look at and the risk of blowing my own trumpet. But I've got the different strategy on it Frisbee. I can send you a copy of.

0:28:45.730 --> 0:28:46.30
Joseph Elliott
Yes.

0:28:46.830 --> 0:28:58.880
Interviewee C
And a case study on **** last month we were working on the moment. So that's one of our first projects at design stage, heading out to site soon. I think it's for some DFMA in it.

0:29:0.580 --> 0:29:6.450
Interviewee C
And if there's one other documental thing, I was gonna point you out, and I would probably say. See some final robot now? Probably I'd say that's the construction innovation hub documentation. Very good. The kind of steer where the government wanna go over there, real benefits behind it.

0:29:18.550 --> 0:29:22.760
Joseph Elliott
Yeah, I picked up quite well on that and there's a few research platforms like that. So all papers that came out on the back of it, mainly before COVID there was quite a bit off the back of like the farmer review back in 2016. And then there's loads of that

0:29:35.570 --> 0:30:7.0
Interviewee C
The farmer review. Yeah, yeah. Adapt or die. Whatever he called it was pretty bluntly was absolutely right on that. Also, some of the work that Wilmot would have done if you've come across any of that in terms of the forge, they're office block in London using platform DFMA made some of the technologies and there actually within between the two of us; need 4 digital and certainly Bristol Office riderwood are pretty toxic name and we had a bit of a falling out of them but one of the reasons behind that is and they and on one of our warehouses. You know, kit of parts and use the terminology. Kipper use the terminology kit of parts, get the parts study and it will work. It's mismanaged. They rushed into it, it went wrong.

0:30:50.370 --> 0:30:50.650
Joseph Elliott
Yeah.

0:30:31.950 --> 0:31:1.450
Interviewee C
And now you can return Kit of Parts, it almost has hairs on the back of your neck up, so people frothing at the mouth. So it's a good example of where I don't use that terminology specifically now, but between you, me and the 4 walls to take the work they've actually done is pretty good. And Jamie Johnson has specially, you've seen it in the stuff he's done or this twenty of these talks, he specifically the rest of writing would take all day is actually on the money. And so his mentality and approach to it and the way he's gone about it.

0:31:5.410 --> 0:31:5.750
Joseph Elliott
Yep.

0:31:1.560 --> 0:31:8.770
Interviewee C
A lot of work on it tonight. Yeah, if you search Jamie Johnson on YouTube and some of these speaks and talks on it, then you haven't already worked out.

0:31:9.710 --> 0:31:13.740
Joseph Elliott
Ill definitely take all of those. And now have a look at it.
I think that's pretty much all of all of my questions then.

0:31:19.180 --> 0:31:19.430
Interviewee C
Cool.

0:31:20.700 --> 0:31:23.620
Joseph Elliott
Thank you very much for your time. It's been really interesting.

0:31:27.480 --> 0:31:38.890
Interviewee C
Hopefully have a little too much, but yeah, go ahead and I'll send you a couple of bits and pieces and stuff. We're doing a bits of interest here and like I said, we really should see all sort of, yeah, your output and kind of summary at the end of it, what you're finding.

0:31:39.820 --> 0:31:40.750
Joseph Elliott
Yeah, absolutely.

0:31:39.50 --> 0:31:47.280
Interviewee C

Ohh, I'd be very pertinent to the work I'm doing and I'm the one man band doing this within retail or whatever like so really helped me out.

0:31:47.920 --> 0:32:3.910
Joseph Elliott
Yeah. No, absolutely. I've got got what not even six months now. I've got till the end of the year to write it all up. So yeah, hopefully New Year I'll be able to send it all out and it'll be a it'll be interesting or it'll just be a conclusion is.

0:32:2.270 --> 0:32:4.680
Interviewee C
And stuff for this stuff. Alright, Joseph. Well, thanks a lot.

0:32:6.80 --> 0:32:17.170
Interviewee C
Always been been great to chat and no worries. And if you want anymore. Just give me a shout.

0:32:35.550 --> 0:32:42.860
Joseph Elliott
Yeah, absolutely. Nice one, but enjoy the rest of your day. Thanks a lot. Really appreciate it. Talk to you later. Cheers. Bye.

0:32:39.640 --> 0:32:43.360
Interviewee C
You take it easy. No worries. Cheers. Bye bye.

10.7. APPENDIX G

INTERVIEW D – TRANSCRIPT

17th August 2022	40min, 51sec

0:0:0.0 --> 0:0:0.460
Interviewee D
Afternoon.

0:0:-2.-160 --> 0:0:10.210
Joseph Elliott
Afternoon. Hows things?

Just so your aware I am just turning on the transcript which will record the interview and make notes. It's not 100% accurate, but it's better than me trying to take notes while I'm talking, then try and like working out whats been said. So it just helps a little bit.

0:0:9.190 --> 0:0:13.630
Interviewee D
Yeah, voice recognition has really moved on and it is really quite impressive, yeah, not a problem. That’s fine

0:0:12.510 --> 0:0:26.260
Joseph Elliott
Yeah. Yeah, that's it. And I've done a few of these now and I've gone back through the notes. Some of it's a bit off, but it's sort of enough that you can work out what you're saying.

0:0:27.760 --> 0:0:41.650
Joseph Elliott
Umm. Yeah, so. So what it is really is. I started this degree after my Masters and it was all off the back of a lot of research I was doing. My masters was on retail and like the effects of online retail and all of that, but there was a lot in there that kept cropping up about like productivity and how the UK's pretty bad at productivity in construction. And then the retail is even worse.

0:1:9.630 --> 0:1:9.870
Interviewee D
Uh-huh.

0:1:17.150 --> 0:1:17.430
Interviewee D
OK.

0:0:54.710 --> 0:1:26.290
Joseph Elliott
And then again, it just kept linking between like technologies, the answer and all of this. And there were some good government funded research that happened such as the Farmer report. There's like some called construction 2025 and it's all around trying to implement as much technology to increase construction productivity. Then like for example in car manufacturing you get a new bit of kit that builds the door quicker, you throw it in a line and then automatically make more money off of that. Whereas construction is a lot harder to do that so to what I sort of started looking at what it developed into, was why is construction not like that, but more, more specifically why retail UK so hard for technologies to come into the industry but not really be effective or not really be implemented. And what I found was like the technology there it a lot of it's being used in the bigger stuff.

0:1:57.190 --> 0:1:57.430
Interviewee D
Yes.

0:1:56.960 --> 0:2:7.10
Joseph Elliott
And like the London fit out and supply, but in retail environment, it's just not getting adopted well enough. So yeah.

0:2:4.930 --> 0:2:8.210
Interviewee D
Umm, when you say retail, you mean our division or?

0:2:8.390 --> 0:2:33.160
Joseph Elliott

Yeah, that's it. So. the purpose of this interview really is just forming your experience or what you've sort of found in terms of trying to get a technology in for whatever is could be, could be a new software, could be a new design kit and then how you found trying to actually get people to implement it also getting the business to sign it off and that sort of stuff?

0:2:47.600 --> 0:2:48.830
Interviewee D
Yeah, yeah.

0:2:34.860 --> 0:3:3.470
Joseph Elliott
And that's pretty much where it is cause then what I'm trying to do is find out what the blockers actually are, so then give like some conclusions and recommendations so if we start to do things differently, could it all change? And there's a lot of like technology adoption theories out there that are quite widespread in, like I say in like manufacturing or IT companies, but they've never been implemented in construction companies. So that would be the sort of the link I would try and do.

0:3:3.810 --> 0:3:4.30
Interviewee D
Yeah.

0:3:4.880 --> 0:3:7.850
Joseph Elliott
So that's pretty much it in a nutshell.

0:3:13.440 --> 0:3:14.910
Interviewee D
Yes, got it.

0:3:8.640 --> 0:3:19.170
Joseph Elliott
What I'm doing it's just get started. Obviously the questions are just very open there. There's no wrong answer at all. It's purely just what your thoughts and views are on it.

0:3:19.680 --> 0:3:19.940
Interviewee D
Yeah.

0:3:21.590 --> 0:3:34.890
Joseph Elliott
Alright, So for the first one. Have you ever experienced implementing or adopting a new

technology in your current role, and if So what are the main positives and negatives you found with that?

0:3:35.970 --> 0:3:39.30
Interviewee D
Yeah, I mean, I'm when you look at that sort of thing, in a more holistically or sort of longer term, you know certainly within architecture you know technology is completely and utterly so changed our world. You know from when you know sort of also this is outside of the company. You know from when we started you know my career you know was on the drawing board and yeah just working on sort of amazing drawings and You know, obviously in implementing some AutoCAD and then sort of moving into sort of Revit and 3D and you know in affecting incorporating all those kind of new softwares and some technology has completely changed things I'd say for the positive.

0:4:21.640 --> 0:4:24.50
Interviewee D
However, there are some negatives that come with it as well.

0:4:24.670 --> 0:4:25.90
Joseph Elliott
Yep.

0:4:25.670 --> 0:4:40.450
Interviewee D
Certainly to have back then, you know, the designers, architects used to really sort of focus on detail. You know, you had to get it right first time kind of thing about the problem now is that it's so quick, so easy that actually. Umm, you know the speed of.

0:4:44.30 --> 0:4:48.280
Interviewee D
Design and architecture that has kind of just accelerated to beyond kind of.

0:4:51.980 --> 0:4:55.210
Interviewee D
Yeah. So you know five fold probably.

0:5:4.50 --> 0:5:4.360
Joseph Elliott
Yep.

0:4:57.20 --> 0:5:27.610
Interviewee D
And what that means is actually clients expectations have completely changed as well and so technology often to brings you know speed benefits and efficiencies, but then at the same time demands increase as well. And so when you probably look at you know the number of projects that they're we're churning out now compared to 10-15 years ago, would be you know significant is that a positive? Yes, probably. But actually at the same time. Is probably a lot more mistakes than sites there's probably.

0:5:31.530 --> 0:5:36.510
Interviewee D
No discrepancies and actually stress levels are probably five fold as well. On top of that.

0:5:38.650 --> 0:5:44.740
Interviewee D
Despite the demands and obviously clients so much more demanding than the whole industry has kind of speed up.

0:5:45.450 --> 0:5:45.680
Joseph Elliott
Yes.

0:5:45.160 --> 0:5:52.50
Interviewee D
Umm. And that's probably the case as well on site as well. Actually in the construction you know.

0:5:51.520 --> 0:5:52.80
Joseph Elliott
Yeah, that's right.

0:5:52.810 --> 0:5:56.420
Interviewee D
Demands now have increased. So yeah, so looking You know, across that period, definitely some, you know, advancements and improvements, you know, just little things like in my world.

0:6:6.820 --> 0:6:27.690
Interviewee D
And simply, you know, just getting an iPad with an Apple Pencil has completely changed. You know, my job in a way and certain design managers, you know, being able to just mark up simply simple things really, but actually make a big significant difference. Marking up drawings, send them straight out via e-mail.

0:6:29.440 --> 0:6:35.230
Interviewee D
I have presenting on the screen to clients, you know, as you sort of mark up digitally.

0:6:57.700 --> 0:6:57.910
Joseph Elliott
Yep.

0:6:36.500 --> 0:7:0.710
Interviewee D
You know, compared to what, five years ago, we were printing off drawings, you know, reams and reams of paper as well, marking up scanning, sending off to your e-mail, then send off to the client and then then come back and it's just, you know, a much, much longer process. And now obviously you can't do quick markups. So just quite simple adoption. But actually it's made a big difference to my role, let's say.

0:7:0.790 --> 0:7:31.20
Joseph Elliott
Yeah, absolutely. And that's even translated the exact same thing can be seen on site. You know, nowadays pretty much all of the site managers should, if not do, have an iPad so they can do the same. But even when I started four and a half five years ago, I remember asking for an iPad and kept on going. Yeah. And they gave me just a like, the most basic one. You couldn't even use pen width of that.. That's just pretty much like taking my laptop round. It doesn't really help me. I need like, a one like.

0:7:46.240 --> 0:7:46.830
Interviewee D
Ah yes.

0:7:52.850 --> 0:7:53.180
Interviewee D
Yeah.

0:7:31.100 --> 0:8:1.70
Joseph Elliott

So even like Just marking up notes. that's quite quick. And I got asked So what are you gonna do with that? I was like, I just send them straight out. And then, like, say, now everyone starting to use it and do it, and it does with make it that little bit quicker.

0:8:4.250 --> 0:8:5.280
Interviewee D
Yeah, exactly.

0:8:1.390 --> 0:8:5.540
Joseph Elliott
And it means uh, conversations happen a lot better. So it does it benefit.

0:8:5.960 --> 0:8:35.830
Interviewee D
But then at the same time, yeah, the amount of times I've taken taking the Mickey out of, you know, it's a, you know, the the old school directors, who are still on their notebook writing down detailed notes I think hasn't adopted the technology. But then the younger or dynamics bunch have. And so it's that, that's one of the probably leads on to another question you have is why hasn't the adoption within retail perhaps been as quick as other divisions, I'd say actually.

0:8:44.950 --> 0:8:46.970
Interviewee D
And in terms of the leadership?
Apart from a new younger fresh individuals, they're actual sort of quite really old school in their in their.

0:8:59.170 --> 0:9:0.210
Joseph Elliott
Yeah, its interesting.

0:8:58.90 --> 0:9:16.930
Interviewee D
Umm, you know you complete this? No in their approach and they are adapting and changing and you've got the likes of soe directors, you know, their very much kind of, you know, want to push the boundaries probably more so kind of *****, but then you do have, you know quite a few sort of others who are just resistant.

0:9:17.870 --> 0:9:18.180
Joseph Elliott
Yeah.

0:9:28.830 --> 0:9:29.80
Interviewee D
Yeah.

0:9:22.560 --> 0:9:51.900
Joseph Elliott
That's right, it doesn't go any way. No, it's funny. I'm talking to others, and he's obviously trying to implement a lot. And he was saying like what he finds in the company is the top down change, isn't there? What is there is, you know, the very high level director to go. Yeah, we can see there's a need for it. So let's do it. Just go away and do it. But they don't want to know anything about it. They don't want to know how it works and stuff, which means everyone's implemented it. But if they're not willing to change to adapt to it. Then it's all well and good spending all this money. But you know it's it's never properly gonna work.

0:9:59.90 --> 0:10:6.40
Interviewee D
Yeah, exactly. Yeah, every everybody needs to be using the the same system. Yeah, and I'm quite pleased, actually, you know, recently.

0:10:7.50 --> 0:10:15.160
Interviewee D
But I did. I always did feel like retail were behind the curve, just in terms of, you know, it's a project management systems.

0:10:15.340 --> 0:10:16.930
Interviewee D
Umm, you know?

0:10:18.190 --> 0:10:27.80
Interviewee D
Kind of program tracking just even like time sheets. You know, submissions. All that stuff is so archaic still.

0:10:28.930 --> 0:10:59.350
Interviewee D
You know what coming from other companies, who you know, I'd say it's still worse and still reasonably I would score to the company, but actually they had you know Jigsaw which was you know onlines of platform that they've developed in house. You submitted all of the time sheets online through that system that was automatically generated then it spewed out the reports and actually the guard, the processes that the accounts team and commercial team have to go through.

0:11:8.460 --> 0:11:9.210
Joseph Elliott
Absolutely.

0:10:59.470 --> 0:11:9.840
Interviewee D
Why you just use an Excel and they're literally copying numbers from one document to another to another to another, and it's and none of it's automated.

0:11:25.830 --> 0:11:26.90
Interviewee D
Oh yeah.

0:11:10.660 --> 0:11:40.910
Joseph Elliott
It really is crazy. I was having this conversation with others who are looking to get involved in like the AutoCAD sort of product management system. now rolling that out or trialing it on a couple projects in a minute. But let's try to explain to them like even just setting up a job now you have all the commercial guys setting them up on Excel documents one after the other, typing in the same project #100 times. And then on our side, health and safety document is pretty standard.

0:12:5.360 --> 0:12:5.750
Interviewee D
Yeah.

0:12:6.650 --> 0:12:7.70
Interviewee D
Exactly.

0:11:40.990 --> 0:12:10.960
Joseph Elliott
You just adapt and stuff, but it's not adaptable, you just redo the same thing over and over. It's so inefficient. So yeah, they're there is stuff and there's stuff out there that does it for the big guys. You know, the likes of Kier and Lang ORourkek makes all that. They've got it. They do it day-to-day and it's just not even a thing as well as trying to actually implement it is the big one. And it was interesting. My research for this. There was actually a case study.

0:12:11.60 --> 0:12:33.630
Joseph Elliott
Yeah. Fit out there actually did it on a couple of projects in London that they did since finally paperless. So just all like on iPads and stuff. But they also started using like different sort of techniques and methods and it the results of the back of it about how much more efficient it was would just rageous. So I think they've started now doing it all so.

0:12:33.920 --> 0:12:34.210
Interviewee D
Alright.

0:12:34.370 --> 0:12:39.320
Joseph Elliott
And might be something that translates into retail, but it's taking its time.

0:12:40.50 --> 0:12:49.990
Interviewee D
And that's the thing we've, you know, the problem is, you know, we've sampled the commercial system and the way obviously I know sort of the.

0:12:50.850 --> 0:13:11.380
Interviewee D
The group commercial system forget what's called now, but that's kind of been updated, which obviously someone kind of tackles with and get some very stressed about, right. Actually it's all of the other sort documents that feed into that, which is all kind of through Excel and to your point around actually the adoption of the technology has got to come from the top because actually if.

0:13:13.160 --> 0:13:21.860
Interviewee D
You know, if the likes of me and you just try and implement our areas and change things it, it just won't work because it won't be compatible with the rest of the And you know the processes. So I've got a position where actually within minutes of commercial reporting I've got in affect the guys kind of producing fee proposals and excel.

0:13:54.60 --> 0:13:54.690
Joseph Elliott
Exactly.

0:13:35.830 --> 0:13:56.180
Interviewee D
And then they will update their fee trackers I in effect and I'm trying to make this more efficient, but in effects I'm copying and pasting. You know a lot of that information over to my commercial tracker. And because someone has responsibility ownership of the accounts, theyre in effect copy and paste in that information into her accounts.

0:13:57.180 --> 0:14:18.890
Interviewee D
And then obviously that spews out kind of the various reports etcetera, but there must be an automated you know way of kind of implementing that. But going back to the point, it has to be

kind of wholesale change across the whole piece rather than just focusing on a department or piece meal and that's direction and that investment is kind of come from the top.

0:14:19.300 --> 0:14:20.20
Joseph Elliott
Yeah.

0:14:19.610 --> 0:14:23.280
Interviewee D
Rather than just individuals or individual departments.

0:14:23.700 --> 0:14:40.300
Joseph Elliott
Yeah. It's gonna come from the top, and it's gotta be committed to as well. It's similar to what people keep saying. And so all technology specifically is the, you know, we'll go and attend a meet, we'll set project and yeah, we're gonna use this. It's gonna be great. You know, the new snag, we're gonna definitely use it.

0:14:46.140 --> 0:14:46.360
Interviewee D
Yeah.

0:14:41.450 --> 0:15:1.650
Joseph Elliott
And then, you know, not only supply chain really know what it is, and arent really set up for it. So you're trying to use it, sort of with one hand behind your back because not everyone it it's the same tool principle there and like say if you try and do something new with everyone else doing it the old way, you're just crashing and it just doesn't make it, almost makes it harder to do anything.

0:15:1.550 --> 0:15:1.820
Interviewee D
Yeah.

0:15:2.620 --> 0:15:18.200
Interviewee D
But on the positive side, I think you know, just to be for the introduction of kind of uh, power BI, you know, with people pushing that forward and actually proving it within clients and now they're obviously looking to deploy that across the other accounts you know it does kind of prove at the same time that you know that they are making change and only recently.

0:15:44.70 --> 0:15:44.280
Joseph Elliott
Yep.

0:15:35.400 --> 0:15:48.50
Interviewee D
I'm kind of contradicting what I'm saying in the way, but yeah, you've kind of got to tackle these technology implementations in a byte sized manner, but there has to be an overall strategy. I think that's what it what I'm trying to get to.

0:15:48.380 --> 0:16:1.990
Joseph Elliott
No, it does make sense though. OK, so then what do you think? So if you're looking to implement a new technology, what would you see as the key SuccessFactors? So getting it actually into the team, rolling out essentially.

0:16:5.30 --> 0:16:10.170
Interviewee D
Probably the first element is there has to be a problem there in the first place.

0:16:11.440 --> 0:16:14.490
Interviewee D
What is the problem statement? What's not working?

0:16:14.900 --> 0:16:15.200
Joseph Elliott
Yeah.

0:16:15.380 --> 0:16:25.530
Interviewee D
The amount of times that I've seen, for example, the central kind of BIM team, they get this, you know, new gimmick is fancy bit of kit, they spend loads of money.

0:16:26.220 --> 0:16:31.190
Interviewee D
And it's not really used because actually it's not really solving an issue or problem.

0:16:33.980 --> 0:17:4.940
Joseph Elliott
They started when I very first started this. I had to submit like a research proposal to the UNI. One of the things I didn't do or what I wanted to do was around miss-sold technology almost, so people adopting stuff because it's the new thing and I think BIM is perfect example of everyone saying, yeah, we're gonna use BIM on a project. We're gonna use BIM on project. Actually all we're doing is creating 3D model like the commercial guys aren't using BIM. So you're not really using that, that the project team aren't using it. So you're not using that aspect.

0:17:7.860 --> 0:17:8.340
Interviewee D
That's it.

0:17:5.40 --> 0:17:11.670
Joseph Elliott
All you do it is designing a 3D model for people, label it them and then get annoyed when they say it doesn't really work properly.

0:17:12.80 --> 0:17:20.470
Interviewee D
Yeah, yeah, massively. And I think would be, obviously I could talk about that for a long time, but you know been through a big sort of process, you know, working through BIM and actually working out where it gonna work and where it's not and actually predominantly in my world in terms of high, high paced kind of roll out work. It doesn't really work.

0:17:37.750 --> 0:17:38.30
Joseph Elliott
Yeah.

0:17:34.900 --> 0:17:38.710
Interviewee D
Let's say the client fully on board with adopting at least the board.

0:17:39.330 --> 0:17:46.200
Joseph Elliott
That's it. And you need everyone, every single player to be well up for it as well and fully trained and set up for it.

0:17:46.640 --> 0:17:47.250
Interviewee D
Yeah.

0:17:47.330 --> 0:17:49.740
Interviewee D
OK. But going back to the, I think yeah kind of problem statement in the 1st place and establishing the need for technology.

0:17:59.400 --> 0:17:59.810
Joseph Elliott
Yep.

0:18:0.590 --> 0:18:5.620
Interviewee D
Then obviously there's gotta be the analysis kind of stage where you're working out what is the best product? What is the best solution rather than jumping wholesale into, you know, a particular product?

0:18:19.520 --> 0:18:24.660
Interviewee D
Then obviously there's the business case piece around it. You know, is it going to stack up commercially?

And what are the rewards or the benefits?

0:18:29.710 --> 0:18:40.250
Interviewee D
So there's that some whole benefits paper required, once you've actually procured and got it. It's all about. So training, isn't it? And an integration team.

0:18:40.930 --> 0:18:53.640
Interviewee D
Making sure that every knows how to how to use the technology and kind of a staggered kind of implementation on suggest as well depending on how you know significant change it would be.

0:18:54.570 --> 0:19:2.340
Interviewee D
Don't try and just jump wholesale into something kind of like I said before and needs to be a staggered approach.

0:19:2.880 --> 0:19:3.120
Joseph Elliott
Yep.

0:19:5.250 --> 0:19:5.720
Interviewee D
And then.
Yeah, and. And I guess just like with, you know, some firm projects really kind of a post implementation review, this PR is quite key as well and don't just kind of system allows you know once you've got the solution in place actually review it on an annual basis and make changes and adapt it and.

0:19:34.580 --> 0:19:48.830
Joseph Elliott
Then out of that, do you think there's anything that's specific just to like the retail side of things? So like anything that would be different in sort of your role within retail, but maybe if you went into construction or bigger company would be different?

0:19:50.720 --> 0:19:52.630
Interviewee D
Yeah, just the It's the sheer volume that we're dealing with and the pace.

0:20:0.320 --> 0:20:3.270
Interviewee D
And that sometimes is a benefit, but also a limiting factor.

0:20:10.10 --> 0:20:18.840
Interviewee D
Payments are key, you know, example of that, you know doesn't really work unless you're gonna tackle a whole state or for larger projects.

0:20:28.780 --> 0:20:29.810
Joseph Elliott
That makes sense,.

0:20:38.800 --> 0:20:49.130
Joseph Elliott
Then, when you've when you sort of try and implement that, trying to get everyone to start using it, what would you see as the key barriers to things that are blocking at that are stopping it from actually being successful?

0:20:50.510 --> 0:20:50.850
Interviewee D
Umm.

0:20:51.610 --> 0:20:52.730
Interviewee D
I would say.
theres got to be capacity for change.

0:21:0.910 --> 0:21:2.780
Interviewee D
So if everybody's too busy. Yeah, they just won't adopt it.

0:21:6.870 --> 0:21:7.80
Joseph Elliott
Yep.

0:21:7.290 --> 0:21:8.90
Interviewee D
Because actually. At any change at first will create inefficiencies. And any new technology will actually in the first probably in the first few weeks or month it probably will create inefficiencies and actually you'll end up spending more time because you're trying to learn than your technology. And then over a longer period then obviously then you see the benefits.

0:21:33.400 --> 0:21:46.440
Interviewee D
So yeah, definitely, definitely it's capacity within the team. And also you've gotta identify the right people to kind of adopt it and drive it forward and bring the rest of the guys along the journey.

0:21:47.150 --> 0:21:47.350
Joseph Elliott
Yeah.

0:21:47.780 --> 0:21:54.810
Interviewee D
Quite often. So the younger demographic that's of the ones to who get excited about the tech and push it forward.

0:21:55.740 --> 0:21:56.10
Joseph Elliott
Yep.

0:22:0.200 --> 0:22:16.30
Interviewee D
Yeah. So I wouldn't say necessarily in retail to be fair, but sometimes cost, right? But actually, yeah, I I'd say actually in retail you know the guys are always open to, and can spend money. That's not usually the limiting factor which is positive.

0:22:16.770 --> 0:22:17.130
Joseph Elliott
Yep.

0:22:20.520 --> 0:22:23.360
Interviewee D
Also, I guess IT infrastructure can be. You know a big blocker and a an issue that we have to get through, that's often very Very slow process, you know. Just I've had an example just trying to purchase a laser scanner. You know, I've Been trying to purchase it for the last. Yeah, we'll say. A year, I've had to go through obviously GDPR checks and IT approvals.

0:22:55.100 --> 0:22:55.440
Joseph Elliott
Yeah.

0:22:50.640 --> 0:23:1.10
Interviewee D
They're not huge amount of forms and getting and I get why, but it has been a very, very slow process and then sort of in affect kind of pulled together.

0:23:3.850 --> 0:23:21.400
Interviewee D
Then got that all approved and then it had to go actually knows something finance director had wanted to get involved and he wanted a business case, like comparison piece between renting a laser scanner and purchasing it. And so the whole process is taken a long, long time.

0:23:22.290 --> 0:23:24.840
Interviewee D
Finally its approved. But now we've got six week wait.

0:23:29.370 --> 0:23:30.980
Joseph Elliott
And you probably needed it last week.

0:23:31.690 --> 0:23:35.240
Interviewee D
Yeah, to be fair, we're renting once, at least those are good, so yeh
That's it. And just I guess it's all about training and isn't it making sure that people are right training.

0:23:46.240 --> 0:23:47.20
Joseph Elliott
Yes, that’s understandable.

0:23:49.100 --> 0:24:8.990
Joseph Elliott
Then being given like a new technology like say about this latest scan, now you're about to sort of roll it out, get everyone to use it. What sort of methods would you use to try and make it go as successful as possible? You know, things like what sort of communication mentioned about training, would that be like pilot test trial and that sort of thing?

0:24:10.140 --> 0:24:11.10
Interviewee D
Yeah, definitely.

0:24:13.350 --> 0:24:16.980
Interviewee D
Yeah, I mean, probably the laser scanner adoption is quite a good example where.

0:24:21.920 --> 0:24:29.830
Interviewee D
Yeah, certainly, we'll kind of undertook some a lot of analysis around, you know, sure we've got the rights of products, the rights of scanner.

0:24:30.950 --> 0:24:32.650
Interviewee D
We went off into tested a few times Umm. And rented them just to prove, you know, properly test them out on the field rather than just a sales Rep kind of showing you what they can do.

0:24:43.900 --> 0:24:52.230
Interviewee D
And so I think that's quite key to before you to jump straight into kind of purchase purchasing something just going through full testing.

0:24:55.0 --> 0:24:58.40
Interviewee D
Sorry I've I've lost my what was the question? Again here was the.

0:24:57.530 --> 0:25:2.520
Joseph Elliott
So like, if you're looking to implement it, looking to get everyone to sort of start using it, how would you?

0:25:1.390 --> 0:25:7.740
Interviewee D
Well, that's. Yeah, that's it. So yeah. Yeah, kind of shop 100% around.

0:25:12.130 --> 0:25:13.150
Interviewee D
Kind of setting up Uh, big training sessions kind of communicating across the wider business and within the team around. Yeah, the benefits it brings build up some, build some.

0:25:27.180 --> 0:25:27.410
Joseph Elliott
Yeah.

0:25:25.530 --> 0:25:32.90
Interviewee D
Excitement around that new technology, making sure it's not just isolated to the team.
So send it with the laser scanner where? Then, at six weeks before it's procured.

0:25:40.40 --> 0:25:54.990
Interviewee D
We're putting together like a bit of a capabilities of page and also a video to demonstrate what it can do. And so a bit of a sales kind of piece, but actually look also at the same time, yeah, just so that everybody's kind of aware that we've got this and can be used.

0:25:57.610 --> 0:26:8.420
Interviewee D
And yeah, and certainly part of the package, the likely team are coming in. They'll be sort of setting up some training sessions with the guys and.
You kind of need to identify specialists, I think within the team and that others can go to.

0:26:18.640 --> 0:26:19.100
Interviewee D
So Uh, you're probably best off. Yes, given you know the general teams from training, but then some more advanced training to, you know, specialists within the team. That could be the go to people.

0:26:36.350 --> 0:26:36.640
Joseph Elliott
Yeah.

0:26:36.980 --> 0:26:38.410
Interviewee D
Yeah, I think that probably covers.

0:26:38.30 --> 0:26:38.600
Joseph Elliott
Makes sense.

0:26:43.400 --> 0:26:50.770
Joseph Elliott
If you to give advice to another contractor that's looking to implement something similar, what 3 tips would you give them?

0:26:52.110 --> 0:26:52.500
Interviewee D
Umm.

0:27:0.320 --> 0:27:1.500
Interviewee D
Probably say.

0:27:8.860 --> 0:27:10.600
Interviewee D
I think I just carry out your research.

0:27:13.50 --> 0:27:13.520
Joseph Elliott
Yeah.

0:27:12.460 --> 0:27:14.410
Interviewee D
Get research before jumping in.

0:27:15.50 --> 0:27:15.660
Interviewee D
Umm. To implementation training subset crucial the amount of times I've seen.

0:27:32.830 --> 0:27:33.110
Joseph Elliott
Yeah.

0:27:24.500 --> 0:27:34.880
Interviewee D
You know, I was bringing some new piece of kit and then it just kind of doesn't really get used. It's not sort of adopted across the whole business. I think probably a good example of that would be the 360 cameras.

0:27:40.600 --> 0:27:41.230
Joseph Elliott
OK. Yeah.

0:27:44.910 --> 0:27:59.440
Interviewee D
You know, we're still actually where we're paying something like 700 pounds a month across the end I wasn't even realized. I didn't realise we had an enterprise agreement £700 a month and who most people weren't even aware of.

0:28:5.630 --> 0:28:5.930
Joseph Elliott
Yep.

0:28:3.670 --> 0:28:22.270
Interviewee D
Infective kind of host the platform for the vieweet and actually still only probably 2 accounts and sometimes yeah, maybe free or actually using the technology. And so again it just needs to be people need to be educated and it needs to be sort of adopted across the board.

0:28:23.40 --> 0:28:23.460
Joseph Elliott
Yep.

0:28:23.660 --> 0:28:28.200
Interviewee D
The guys to make best use of the technology and also the investment as well.

0:28:29.550 --> 0:28:37.100
Joseph Elliott
There's a bit of a communication piece and that, like, not just the people that are going to use it, but also the people around them to know at least there.

0:28:37.800 --> 0:28:49.310
Interviewee D
Yeah, exactly. Uh. So, yeah, communication. And then probably PR I think is like posting limitation views, not just accepting that that's the best technology.

0:28:57.820 --> 0:29:10.730
Joseph Elliott
That's pretty much it. And it's really just if there's anything else you thinks important on sort of technology adoption, if there's any sort of anything that you think, Gary, but look at this or go talk to certain people or anything like that?

0:29:27.760 --> 0:29:28.150
Joseph Elliott
Yeah.

0:29:13.450 --> 0:29:38.950
Interviewee D
You know what? Yeah, something's that's aren't quite pleased with, actually. What's happening, I find within my team, it's actually really difficult to stay abreast and kind of aware of kind of what technology is coming up within the industry unless. Yeah, you kind of out there all the time speaking to people, you know, all of us just get so siloed. We've announced day jobs and not necessarily aware of what's going out there and within the industry. So we obviously try and go to, you know, people and we're design week and various other exhibitions, but actually you only get a small sort of I guess of cross section of what's out there so. That's brilliant. That's what we need. You need. You need people to be dedicated to this and feed it in. Innovations into the business. So I'm really pleased. But at the same time, we mustn't just go to kind of existing supply chain because actually notice come up with the same old kind of ship.

0:30:34.740 --> 0:30:38.80
Joseph Elliott
Yeah, that's old or missold stuff. Like I said at the beginning.

0:30:38.430 --> 0:30:50.950
Interviewee D
Yeah, exactly. Actually, we need to be that innovation team needs to be out there. You know, speaking to entrepreneurs, you know, startup companies. They're the ones who are really innovating and moving things forward.

0:30:54.150 --> 0:31:21.750
Joseph Elliott
Know that our call like are we saying about that as well? You mentioned earlier about sort of making it exciting for the change. So like I've been that for a good one like exactly like you say people get stuck in their way. But if you can build up the hype of something, everyone then wants to get on the bandwagon and do itself and that's quite a good one that if you can start promoting it, even if you're not promoting something specific, just promoting change. It can then really start driving some impact.

0:31:22.160 --> 0:31:26.720
Interviewee D
Definitely. And you know the construction industry certainly.

0:31:27.790 --> 0:31:29.560
Interviewee D
You know, for you you've got sort of got A lot of the individuals within the industry also will be stuck in their ways, you know, and you do have quite a few of the old school. Yeah, individuals across the across the company and across the industry.

0:31:48.350 --> 0:31:51.340
Joseph Elliott
That's worth going towards and come up quite a bit.

0:31:51.760 --> 0:31:57.590
Interviewee D
Yeah. Ohh like. Well, exactly. And that's the way they've done it and that's you know and they won't change so yeah. So that's probably why I suspect that and I don't know why it's different to, say, other industries, but yeah. It's just that that's why Uh technology hasn't necessarily been adopted as quickly as other industries.

0:32:14.420 --> 0:32:21.850
Interviewee D
But then you must have an old demographic, you know, across every guess industry. So I don't know why necessarily construction. I guess you have quite traditional construction methods and the way of doing things.

0:32:50.420 --> 0:32:50.680
Interviewee D
Yeah.

0:32:26.830 --> 0:32:57.820
Joseph Elliott
That's it. I mean, while sort of started to see a lot of is the amount of people in high positions have worked their way up. So everything every bit of success is built on experience. It's not, you know, in it you can go straight to the top of a company because you've brought in a new technology and you're the leader of that and you're making everything efficient, whereas that doesn't really happen in construction. It's more of a like it's all about experience.

0:33:6.610 --> 0:33:6.820
Interviewee D
Yeah.

0:33:7.750 --> 0:33:10.820
Interviewee D
You're not. You're a dinosaur. Yeah, exactly.

0:32:58.130 --> 0:33:19.840
Joseph Elliott
So you almost then sort of kept at that. No, no, no. Keep doing the same way. And then when you're at the top, then you can maybe make a change by the time you're there, you're out of touch with the new stuff. Yeah. So, like, yeah, you make the way all the way to the top and then you're talking about early about it's outdated by 15 years because it's not new anymore. But.

0:33:20.70 --> 0:33:21.730
Interviewee D
Yeah. And actually it's uhh, it's a predominantly sort of male dominated industry as well, isn't it? And I'm not sure if that has an effect on.

0:33:32.230 --> 0:33:32.680
Joseph Elliott
Yeah.

0:33:33.530 --> 0:33:47.530
Joseph Elliott
apparently not the stubbornness to change as well is definitely in there quite a bit like second stuck in your way, but not for real. Any benefit or anything just because you don't wanna change seeing that quite a lot and not essential aspects of that.

0:33:49.20 --> 0:33:49.350
Interviewee D
Yeah.

0:33:51.770 --> 0:33:57.360
Joseph Elliott
So that's pretty much. That's what I see the end of it, then. Sorry, I've gone over a little bit.

0:33:57.930 --> 0:34:0.260
Interviewee D
And I hope it's helpful.

0:33:59.380 --> 0:34:10.630
Joseph Elliott
Thanks a lot for that, really appreciate it. I'll go away sort of get all of this together to a few analysis on everyone and books and then start typing up the conclusions.

0:34:11.60 --> 0:34:12.650
Interviewee D
All right. Awesome. That's good.

0:34:11.690 --> 0:34:15.480
Joseph Elliott
Uh, yeah. Like let you know all goes and get anything out of it.

0:34:14.250 --> 0:34:17.920
Interviewee D
Yeah, we could see. Yeah, if we could see the paper, actually, the end of it.

0:34:17.590 --> 0:34:25.300
Joseph Elliott
Yeah, yeah, yeah, I've said Ill sent it to everyone that we've done and use web and stuff. They at the end of the year now, when I hopefully get it all done.

0:34:25.820 --> 0:34:29.700
Interviewee D
No, I thought so. Have you Umm, how many years have you got left? Is it just a single year?

0:34:29.790 --> 0:34:44.740
Joseph Elliott
Yeah. Yeah. So I've got my submission is end of December and then I've gotta sit like a intrvirew, so it should sit like a panel of people and have an interview and then that's that should be like February time and then yeah, and find they'll be over, hopefully.

0:34:48.470 --> 0:34:52.340
Interviewee D
Yeah, exactly. how you gonna do anything after this?

0:34:52.830 --> 0:35:0.520
Joseph Elliott
At the minute definitely not, but the way I always goes is I'll probably get into next year with not a lot of to do and be like, yeah, might as well do another one.

0:35:0.830 --> 0:35:2.870
Interviewee D
Yeah, sucker for punishment.

0:35:33.930 --> 0:35:40.500
Joseph Elliott
And yeah, with work and everything like you get to a point. I haven't done anything for a while. Then you got to get yourself back into it and. It's been a it's been a challenge, but hopefully it'll be over there soon and back on something else.

0:35:46.930 --> 0:35:48.290
Interviewee D
Are you still working five days a week?

0:35:48.840 --> 0:35:50.80
Joseph Elliott
Yeah, yeah,.

0:35:50.750 --> 0:35:55.280
Joseph Elliott
Yeah, this get done pretty much as in when I can and weekends and stuff.

0:36:6.480 --> 0:36:7.640
Interviewee D
Yeah. Imagine.

0:35:50.750 --> 0:35:55.280
Joseph Elliott

Thank you. Thank you for your time. Really appreciate it. And I will catch up soon.

0:36:51.920 --> 0:36:53.160
Interviewee D
Alright, awesome. Cheers, Joe.

0:36:53.560 --> 0:36:54.380
Joseph Elliott
Cheers. Bye bye.

10.8. APPENDIX H

INTERVIEW E – TRANSCRIPT

30th August 2022	47min, 21sec

0:0:0.0 --> 0:0:0.330
Joseph Elliott
Afternoon.

0:0:1.020 --> 0:0:1.330
Interviewee E

Afternoon. Hows things.

0:0:1.780 --> 0:0:5.330
Joseph Elliott
Not bad thanks

So I'm just going to start the transcript then will give an intro and we can get started. Youll see it dictating what were saying on the side of the teams

0:0:5.420 --> 0:0:6.330
Interviewee E

Yeh not a problem at all.

0:0:6.540 --> 0:0:28.360
Joseph Elliott
So, I looked at doing this and started the whole thing off by looking at an issue and what the big one was, being productivity in UK construction and just fact that it's lacking behind other industries. And then the fact that retail is lagging behind other sectors like the big construction of fit out in, in the types of London.

0:0:29.740 --> 0:0:55.400
Joseph Elliott
And what are the solutions to this, with one of the big ones that came up in my previous degree and all the research and that was technology and how, you know, getting a new bit of technology in other industries is just the solution. You know, if you look at car manufacturing, they get a nice new shiny bit of a machine that makes a door 10 times quicker. You throw it on the line and you immediately see more productivity, more efficiencies and better margins.

0:0:56.90 --> 0:1:6.0
Joseph Elliott
Construction can follow that suit, but doesn't. Typically, it's massively lacking behind the curve. So what I wanted to look at is why is that?

0:1:7.180 --> 0:1:19.930
Joseph Elliott
So the whole research started off with you know why is that the case? Why is construction and more specifically retail lacking buying that why don't doesn't technology just fall into place easily?

0:1:21.140 --> 0:1:50.890
Joseph Elliott
It started off very much that, you know, construction projects are different each one and how much the design might be the same. Each project is different. However, that doesn't

necessarily explain why technology in a business doesn't just get implemented simply so then it went into a more social aspect of, you know, the people involved and the barriers of actually getting technology and that's where this comes in. So this isn't necessarily about technology, it's not.

0:1:50.960 --> 0:2:21.740
Joseph Elliott
And it's not about, you know, here's this nice new bit of IT. Whats your experience with it. What this is if you've got a new bit of, technology, but what it could be and you process you know with you might get a new format or we might you know something is changing that sort of change in technology, to make things more efficient and stuff. And what I'm after from yourself is your experience and knowledge of how it works in the business and your experience trying to roll that out through the business and get people and stakeholders to actually buy into it. That's what the purpose of this is really.

0:2:43.560 --> 0:2:44.310
Interviewee E
Makes sense mate.

0:2:43.310 --> 0:2:46.700
Interviewee E
Yeah. The I think the first thing for me.

0:2:51.220 --> 0:2:54.550
Interviewee E
Is the comparison you've used.
Is that the right comparison? By that I mean.

0:3:0.30 --> 0:3:2.580
Interviewee E
You're absolutely right. When you have a car.
Beyond the badge or the engine size or whatever, a car is a car.

0:3:11.260 --> 0:3:11.830
Interviewee E
And. The outcome, if you like, is all in the design.

0:3:19.310 --> 0:3:19.650
Joseph Elliott
Yep.

0:3:18.940 --> 0:3:25.980
Interviewee E
You know the car is the car. Once it's designed to finalised further up the chain or around the chain.
Each and every one becomes a repeat process. Therefore you would assume by productivity creates efficiency.

0:3:34.730 --> 0:3:44.280
Interviewee E
The key though to using that as a prime example versus construction is where I think the wider problem is.

0:3:45.80 --> 0:3:48.10
Interviewee E
And if you go back to that original keyword design. Look at our industry. The client, in their mind, bless them. They have a thought? A plan, an idea.

0:3:58.260 --> 0:4:27.430
Interviewee E
To give that to a consultant to design under an SLA that differs hugely in our industry, as we all know in terms of contracts for obligation, CDP design, design certainty and everyone uses BIM and everyone uses all sorts of, you know cloud surveys to create something. But along that journey, all the time beyond the SLA, what is the terms of people's engagement to do the full design.

0:4:28.280 --> 0:4:32.830
Interviewee E
And then that classic other thing that drops into our industry every day. Is change control.

0:4:36.30 --> 0:4:36.340
Joseph Elliott
Yeah.

0:4:35.830 --> 0:4:38.460
Interviewee E
So to compare a car versus contraction is probably the wrong way because with the car you will get productivity efficiency.

0:4:48.520 --> 0:5:21.410
Interviewee E
And therefore better margin profit, whatever. But in our industry, you can't compare that and I get what you mean. So everybody straight away in their head is thinking, well, they can do it over there. Why can't we do it here? It's almost going back to going back to the Stone Age, I understand what our industry is and it's so people focused lots of people's have lots of drive energy, hot air but lots of other people have different terms under which they're engaging. And their first priority is to look after and protect their own business first.

0:5:21.550 --> 0:5:27.870
Interviewee E
And I'm worried that it's the level of design and therefore further it goes down the chain. It ends with the contractor.

0:5:28.970 --> 0:5:32.410
Joseph Elliott
Yeah, yeah. No, absolutely.

0:5:29.730 --> 0:5:36.150
Interviewee E
That's just my take that you can't compare the two and that's where our problems start. Each and every job is unique in itself.

0:5:41.10 --> 0:5:48.850
Joseph Elliott
Yeah, there's a term they use in literature and it and it's called heterogeneous and that's what construction is.

0:5:49.490 --> 0:5:51.940
Joseph Elliott
And then like car manufacturing is homogeneous.

0:5:53.340 --> 0:6:14.480
Joseph Elliott
Well, I mean, just literally exactly what you're saying is that one thing you can just import time and turn it out over and construction, you just can't do that, cause it's each job is so different.

Constraints are different, people are different. But you know, the lessons learned while tampering implemented COM. It's not a controlled environment. It's always gonna be different.

0:6:18.960 --> 0:6:31.650
Interviewee E
I think it's definitely appetite, Joe, within the business, even within retail to really invest in technology to make decisions more efficiently and undertake our processes more efficiently. No question we would want that.

0:6:49.20 --> 0:6:49.290
Joseph Elliott
Yeh

0:6:32.730 --> 0:7:3.60
Interviewee E
We have innovation sessions with the team. Those sort of key contacts here in London for that sort of technology and innovation piece and the stuff is being rolled out across construction that just would do not work within retail, full stop.

So if you've got some real lumpy multi million pounds static sites that I called them, you can roll out all sorts of innovation. But we're doing 1000 plus projects a year. It has to be scalable, has to be transferable, it has to work in a retail environment.

0:7:3.520 --> 0:7:4.50
Joseph Elliott
Yeh that makes sense.

0:7:3.480 --> 0:7:13.630
Interviewee E
Projects have to be set up, decommissioned, set up, decommissioned every single day on a null, but another of our projects and they rather is that that just doesn't work.

0:7:14.180 --> 0:7:14.420
Joseph Elliott
Yeah.

0:7:14.230 --> 0:7:20.510
Interviewee E
And I've sent a number session with the team. probably a good people for you to talk to you after this.

0:7:37.890 --> 0:7:38.340
Joseph Elliott
Yeah definitely

0:7:24.520 --> 0:7:55.830
Interviewee E
Really nice guys. Really smart. You know, a bit of an IT geek. That's what you sort of need, really. And he talked to me about all sorts of great stuff, the weird and the wonderful. It's we've looked at all sorts of stuff that would facilitate access and egress to site, managing quality differently, managing reporting scope surveys. Just trying to make things more efficient for our guys on the ground, lots of great ideas. And I think that sounds amazing. But in our world, that's just not gonna fit.

0:8:1.450 --> 0:8:1.720
Joseph Elliott
Yeah.

0:7:56.170 --> 0:8:10.780
Interviewee E
And it just becomes a blocker. It just didn't. It didn't actually make people more efficient as it slowed them down. So immediately switched it off because it just doesn't work. So definitely, definitely appetite and interested to be more efficient and improve productivity of our guys, but to roll it out across all of our projects, that is, every single one of them are different.

0:8:21.220 --> 0:8:21.770
Joseph Elliott
Yeah

0:8:21.480 --> 0:8:26.930
Interviewee E
And each account does similar projects very differently because it's a people thing.

Nick will do things very differently to Steve. Steve will do it very directly to Dan. You know, I'm not saying the right or wrong, they're just all slightly different.

0:8:36.810 --> 0:8:38.740
Interviewee E
And so one size doesn't fit all.

0:8:42.90 --> 0:8:42.300
Joseph Elliott
OK yeh because of the different project constraints.

0:8:37.90 --> 0:8:47.720
Interviewee E
There's the different. Yeah, exactly. That's the logic cause. Yeah, it's not definitely one site. Don't feel if you imagine last year we did x number projects.

0:8:48.900 --> 0:8:50.190
Interviewee E
I guarantee you not one of those projects was the same. So going back to the car based analogy versus the construction industry is smallest level, but it's greatest volume.

0:9:4.300 --> 0:9:4.590
Joseph Elliott
Yeh.

0:9:5.340 --> 0:9:12.790
Interviewee E
You know, and invariably some of those are done in a night. How much more efficient can you do something in then one night?

0:9:14.170 --> 0:9:16.700
Interviewee E
You know, someone still gotta get there. Then this could be less.

0:9:17.760 --> 0:9:18.100
Joseph Elliott
Yeah.

0:9:17.840 --> 0:9:22.660
Interviewee E
You still got to do the new normal things, and it's still one night. That's I suppose you could argue to a degree. Does that mean it's maximizing its own efficiency? But it is heavily reliant on

the skill set of that individual to overcome obstacles and little problems that you wouldn't normally encounter on the previous project.

0:9:40.220 --> 0:9:41.640
Interviewee E
It's about being clever.

0:9:42.530 --> 0:9:44.560
Interviewee E
That's the people and the experience.

0:9:45.380 --> 0:9:47.690
Joseph Elliott
Yeah. And that’s it, yeah.

0:9:45.600 --> 0:10:1.580
Interviewee E
But I don't know whether that's the right example that on the biggest stuff we do by scale, people always do something different. So is it a case of training but not one opportunity or technology fits each and every project.

0:10:2.640 --> 0:10:2.920
Joseph Elliott
Yep.

0:10:2.360 --> 0:10:7.720
Interviewee E
Because it's a people thing. So there's a barrier but not negative barrier. It's a reality, isn't it?

0:10:14.130 --> 0:10:14.410
Joseph Elliott
Yep.

0:10:8.30 --> 0:10:21.840
Interviewee E
Yes, but it is. But if it is to be attractive to the sponsors, they gotta invest in it. It's gotta be scalable. And if it's not scalable, then it ain't gonna get any legs. I'm looking at some stuff at the moment separately, around site setup files.

0:10:22.620 --> 0:10:29.190
Interviewee E
Where I see administrators producing Amazon forests for the paperwork currently.

0:10:44.110 --> 0:10:44.300
Joseph Elliott
Yeah.

0:10:29.930 --> 0:10:52.430
Interviewee E
Hundreds of projects, I mean boxes and boxes of paper going out and thinking what on Earth is it, always rubbish now if it doesn't get looked on site. That's the first issue. The second part is it's costing lots and lots of money for administration teams to put all this together. It's not very efficient. So you then start looking at how you can digitise some of this. So I've got that new IT business partner looking at some stuff on how we can, how we can go from hardcopy to electronic copy and straight away. You hit a brick wall with IT security. That's the first thing. Secondly, Mini Me's managed a lot of our sites, as you know.

0:11:10.700 --> 0:11:11.310
Joseph Elliott
Yeah.

0:11:12.100 --> 0:11:29.230
Interviewee E
How can I, for example, lets just use car example, how can I equip car with all electronic access security line that satisfies not just us but our financial customers as an example, to make that digital approach work, it's never gonna allow. It's never gonna happen.

0:11:30.70 --> 0:11:30.780
Joseph Elliott
Yep.

0:11:30.250 --> 0:11:41.110
Interviewee E
And you, you I think as I say, come back to it is absolute appetite but actually rolling it out across such probably the most diverse business unit. we've gone down so many blind alleys and you, you you've got great energy for it. You mentioned one. Never you know earlier. But Great energy. But it just hits the buffers. It's not because people can't be asked just to really of trying to make it fly doesn't work.

0:12:5.510 --> 0:12:6.0
Joseph Elliott
Yeah.

0:12:15.200 --> 0:12:26.490
Interviewee E
On reflection, is the barriers. You know there's IT barriers, legal obligation, security limits, but more important, change control and people.

0:12:27.520 --> 0:12:37.250
Interviewee E
No one construction project is the same. You go now to the iconic Battersea Power Station.

0:12:39.280 --> 0:12:39.880
Joseph Elliott
Yeah.

0:12:39.620 --> 0:12:42.710
Interviewee E
600 brands going in there.

Do you reckon any of them are exactly the same and talk people talk about churn, efficiency, modelling, keeping everything the same. It's not every single one of those units is different because invariably whilst we're doing a couple. Just how diverse are they? Just as customers. One sells the car, one sells a TV. You know it's real rawest turns.

0:13:17.510 --> 0:13:32.380
Interviewee E
But each of the projects themselves, by design from shop front and all the internal and all their needs and requirements, they are wholesale different. Therefore the job is different again going back to that classic, ‘not one project fits all.’

0:13:33.950 --> 0:13:34.590
Joseph Elliott
No, that it.

0:13:34.60 --> 0:13:52.370
Interviewee E
Now, so you gotta fit focus on what all the real barriers are, and I know to some degree you're gonna try to get out of them, but unless you face the barriers, herds, obstacles, call them what you want, we actually can't go forward. So you could end up going the hamster wheel routine if you understand what I mean.

0:13:53.120 --> 0:13:53.470
Joseph Elliott
Yeah.

0:13:53.910 --> 0:14:14.260
Interviewee E
And also I do see a little bit of a similarity to a car plant and whilst that isn't in the yeah, I suppose you could split technology in our world through head office technology.

0:14:14.930 --> 0:14:30.900
Interviewee E
Management, how we operate the office, how we operate the projects behind the scenes and on site technology, how we how we actually deliver projects, how we run them on site. The link to the car plant analogy Is the supply chain that we use.

0:14:34.770 --> 0:14:52.970
Interviewee E
It's the manufacturing and personally I don't think we as professionals know enough about our supply chain and how they work and how they function and how they produce and manufacture on a daily basis. I don't think you know we use a lot of the same sort of supply chain, but I personally don't think we understand them fully. Yeah. When was the last time we went and visited one of their plants or factories or and understood the process of what they deliver from start to finish.

0:15:5.210 --> 0:15:16.550
Interviewee E
And look and work with them to see if there's any efficiencies there, because for me, there's always a desire, generally in society these days, for everyone to become more and more efficient.

0:15:27.260 --> 0:15:27.670
Joseph Elliott
Yeh that makes sense.

0:15:18.660 --> 0:15:33.50
Interviewee E
It has to be the right level of efficiencies and sometimes technology and innovation sometimes comes into play just for the sake of it. And I think it has to be the right one and the right fit for the right business model.

0:15:33.530 --> 0:16:3.720
Interviewee E
Umm. And you know some of the things that we've looked at, you know, we'd we opened up Pandora's box of technology and innovation and some go absolutely nowhere you know the car plant model that you mentioned, you know I looked at that when I was at university I did a piece around lean construction for my thesis and Toyota was one of the first ones that came up with the production line yeah the lean construction that gets done by that person that gets done.

0:16:6.840 --> 0:16:36.970
Interviewee E
And we have looked at that in projects. We looked at lean you know, can we get leaner,

slicker? And it's so difficult, it's so difficult for our world cause not everything fits all but. And that's where the car plant really doesn't necessarily fit what we do, but as a manufacturing as they are manufacturing businesses, it's our supply chains that will have the link to that and personally I think going forward we need to start understanding our supply chain better. I think we get them on board, we use them. Job done, we move to the next job.

0:16:43.870 --> 0:17:13.110
Interviewee E
Umm, the efficiencies we always look at our own efficiencies. I mean, look, yeah, 20 years ago we was all working off sort of 1 screen little computer laptop. Yeah, we've now everyone's now got two screens on their desks. Yeah, I'm looking at three screens. I've got my iPad open as well. And how many more screens do we need to look at to be able to sort of how much more information do we need to glean in for more and more screens? Yeah. So we aren't getting efficient from that point of view and trying to keep up with so much more information.

0:17:14.420 --> 0:17:14.750
Joseph Elliott

Yeh that's a very good point.

0:17:14.360 --> 0:17:33.70
Interviewee E

It does have a problem there as well, and I'll go back over the negative. You're trying to go forward, people then as a consequence of those technology changes, suddenly in our industry and always remember the type of industry we have, we are now on call 24/7.

0:17:34.420 --> 0:17:35.820
Joseph Elliott
Yep, Yep.

0:17:33.860 --> 0:18:6.610
Interviewee E
You don't get that in a car plant. They open the factory, they shut the factory or they change shifts our world to that degree doesn't to 24/7 and then it adds to all the mental health related problems, the stress, the pressure, the diversity and all. That's one thing it I don't think the barrier is to a degree the speed and pace of what we do and trying to nail one fits all but it never does. People are striving to improve but because it's a people like business.

0:18:6.750 --> 0:18:21.40
Interviewee E
You put it on a graph. You got some people that use all smart, clever, slick thinking. No, IT literally Bang Bang, bang. You see some of them, you would be one of those little people. But then you have a slide in scale and then you end up with the caveman.

0:18:22.260 --> 0:18:32.540
Interviewee E
so it all goes back to training again, you know, and everybody. Everybody's on that graft to some degree and we could all say with a level of confidence where we are or where we're not.

0:18:33.520 --> 0:18:35.750
Interviewee E
That is the barrier and the problem as well.

0:18:36.220 --> 0:18:55.250
Interviewee E
They also kept picking up on that. Technology is a sort of link it with sustainability or sudden

sustainability is just absolutely taken off, isn't it? It was bubbling and bubbling and bubbling and now it's in everyone's agendas. Yeah. For me also I think this is.

0:19:17.690 --> 0:19:18.120
Joseph Elliott
Yeh there is a clear focus currently on this.

0:18:56.130 --> 0:19:25.700
Interviewee E
There I'll say a generation thing where you know we see it, we see every day the younger have the appetite to embrace new systems, new softwares, new technologies, the older and not being disrespectful here. But the older have a reluctance to that sort of change and that reluctance to that sort of you know wanting to bring in work on that new bit of software because it's gonna, you know, they're happy to carry on not everyone. But you know generally.

0:19:30.690 --> 0:19:30.930
Joseph Elliott
Right.

0:19:26.90 --> 0:19:46.630
Interviewee E
They're happy to carry on the way that it's always been so until that shift changes a bit like sustainability over the last 20 years, the younger generation is now pumped into everyone coming through universities and everyone that this is the way to do it. The same with technologies in our industry. It's gonna take a while yet for a wholesale shift.

0:19:47.220 --> 0:19:56.880
Joseph Elliott
So do you think that, you know, just through like training and stuff that can be overcome or do you think it's sort of embedded and it's time thing?

0:20:11.820 --> 0:20:15.550
Interviewee E
There's times I think training. I think training is obviously definitely key. But until you've got the appetite for the people that want to be trained.

0:20:21.690 --> 0:20:40.780
Interviewee E
And yeah, people are gonna go and training courses and just sit there and go. Yeah. Yeah, . And the next day, just carry on as normal. Yeah. There has to be also with training, there has to be the appetite, the desire, the one the care the you know the makeup of that individual wanting to be trained in that way and I think that's still a little bit of a generational shift.

0:20:45.880 --> 0:20:54.130
Joseph Elliott
Did you think that appetite, you know, can be given to people in some ways? You know, is it a communication thing?

0:20:55.460 --> 0:21:25.650
Interviewee E
Yeah, I think so. I think it's a mixture of all those sort of factors, but overall it has to be that in the, the individual you know I think they will say after be a bit careful I'll say, but I think we've taken on individuals sometimes in the past for the sake of it cause we need to get the job done. But you look at our skill sets are they the right skill sets you know there's all sudden can they be trained, do they wanna be trained, have they got the appetite for it.

0:21:34.580 --> 0:21:34.870
Joseph Elliott
Yeah.

0:21:25.790 --> 0:21:38.770
Interviewee E
Can you change their mindset? You know, some of them is. No,. Some of them is, yes. And all sudden you've got a mixture of until you've got that sort of ticks for all the boxes. Then all sudden you're moving forward in the right direction.

0:21:39.910 --> 0:21:40.790
Joseph Elliott
Yeah, yeah.

0:21:43.160 --> 0:21:49.310
Interviewee E
Yeah, it sounds horrible, but to take the negative out of a really positive question.

0:21:50.290 --> 0:21:55.660
Interviewee E
You do need to go backwards a little bit, I suppose to understand the detail of what our industry is, the diversity of the industry, albeit it's changing, you know, lots of great, great, highly educated young talent, some great, great females and girls, you know, all coming to join the party. I'm sure. I think is great and but it's and that shift change again, using the graph of, you've got lots of different age people, different technology, different mindsets, different education levels all of that has to be factored in and it is a generational thing. It's gonna continue to take time and time and time.

0:22:43.760 --> 0:22:44.240
Joseph Elliott
Yeah.

0:22:43.560 --> 0:22:49.550
Interviewee E
But the one factor that ruins the whole thing in terms of its drive to go forward is because people change and people don't give you the full, you know, you've got the car manufacturing, drawing and all of its software and points altogether nailed in stone. Nobody can change it. But our industry changes everyday.

0:23:7.800 --> 0:23:8.150
Joseph Elliott
Yeah.

0:23:7.800 --> 0:23:12.930
Interviewee E
Because of a customer at the chain, a consultant or someone missed this or missed that. You still main and all them factors come into place. You. It's like a Grand National race as I call our industry. And if we fall or can't even get over the first hurdle, we're in trouble. So the whole thing stops.

0:23:27.340 --> 0:23:59.390
Joseph Elliott
Yeah, and it's fair, it's why also interested in actually doing it on retail sector specifically, you know, not just generally UK construction and there's quite a, it's quite a lot of debate at the minute about whether you know change in the business and construction is driven by the company itself or by the client, either directly or indirectly. Either they're saying I want you to use this or just indirectly by you know wanting you know more efficiencies you know tighter

margins. For the business has to change and it's it's quite interesting to see sort of the two sides of it all.

0:24:6.440 --> 0:24:25.350
Interviewee E
And I think there's answers to both sides, isn't there? But you know certainly from a client's perspective, you know, looking at certain technologies in the past it does boil down to cost. Does the client wanna pay for it? What benefit are they gonna get out of it by paying 10s of thousands to implement something on a on a project.

0:24:26.990 --> 0:24:55.400
Interviewee E
Yeah, especially in retail, you know, on a £50 million big scheme in the middle of London, 50-70 million, £100 million schemes, you know, yeah, few, 10s of thousands isn't is a bit of a drop in the ocean to introduce a technology here or sudden? Yeah. We've especially in in frameworks and banking worlds all and retail generally they don't. Yeah. They like the idea of it and they start talking about it start looking into it and then at the end of the day they just want their job done. They just want their shops open and they just wanna trade. Yeah, that's essentially what they want. And essentially our clients as simple as what they want is that time cost, speed model. You know, we've seen it on projects, where they need to get it open quicker. They wanna, they want it for cheap as possible. And the quality is important for them. As long as we do that, that's just it. So again, there's a bit of a, a shift with clients. And I think again until.

0:25:39.640 --> 0:25:40.670
Joseph Elliott
Yeah, yeah.

0:25:26.870 --> 0:25:59.180
Interviewee E
Yeah, that changes that that won't necessarily drive sort of focus because we're just obviously carry on doing what our clients want to do. The flip side of it is that from a business point of view is that, yeah, yeah, we've got people like you've mentioned that are look at that are in the business that are looking at technologies and this that they have sat on a call and I think before when showed me and I think every single technology that they showed me, I just thought they left every single technology and stuff that they do in the business, I thought don't really work for us. That's not gonna work for us. Yeah, they showed a bit of modeling, the old modeling for Lords Cricket ground. Yeah. Bit BIMs been the biggest one over the last 20 years. And I've remembered 20 years ago. BIM was always being talked around as the next big thing. And I don't think I don't. I still don't think it's taken off the ground properly 20 years later.

0:26:21.650 --> 0:26:30.880
Interviewee E
Problem is it's relating to cost. All the things the time cost, quality, speed to market that is still the key driver and you know, let's look at our industry to a degree. We could go in and say we're gonna do a job in eight weeks. Someone would say they'll tender to for it, you know.

0:26:42.490 --> 0:26:47.990
Interviewee E
Price always is a pre precursor to an award. Someone would do it in six weeks.

0:26:48.710 --> 0:26:49.310
Joseph Elliott
Yep.

0:26:49.490 --> 0:27:19.860
Interviewee E
The only reason that is because they, you know, we could go in and have a work life balance approach, you know hybrid this, hybrid that and we'll go in and open our site. Do you ask

anybody that all say yeah it's 8 till six a lot of them are it's 12 hours but you go to this other contractor he's seven days a week 14-15 hours a day so that has an effect on work life balance people and everything again but some of that doesn't get discussed or.

0:27:45.460 --> 0:27:45.700
Joseph Elliott
Yeah.

0:27:24.930 --> 0:27:50.860
Interviewee E
Because that's the only way you can get, you know, our eight weeks to somebody else's six weeks on tender down in retail, they will open that site seven days a week working and I don't think it's double shifts. The same people in the old shop fit mentality head to goes back to the you know the old school way I work in 15 hours a day you know for X weeks to get a job over the line and then they're going and have a rest for a week.

0:27:51.790 --> 0:27:51.980
Joseph Elliott
Yep.

0:27:51.970 --> 0:28:3.510
Interviewee E
That is where as the other jobs are biggest after churn and all that it has opportunity. But it's all driven by a commitment appetite, education cost experience versus. How much is gonna cost?

0:28:6.60 --> 0:28:6.550
Joseph Elliott
That's it.

0:28:7.200 --> 0:28:18.750
Interviewee E
So I'm not saying it won't change it again, You know, BIM was mentioned 20 years ago. They're still talking about today, people. They even know what BIM actually means. In three letters, you know?

0:28:20.380 --> 0:28:25.790
Joseph Elliott
No, I've seen BIMs a perfect example of software. It goes wrong, but it gets almost miss sold.

0:28:24.880 --> 0:28:28.310
Interviewee E
And if you ask the client the true cost of BIM.
You could argue it's only really relative to a new build project.

0:28:37.430 --> 0:28:47.0
Interviewee E
How would Banks talked about it 20 years ago? And I remember sitting in a forum actually about 10 years ago where this is the new way forward for banks?

0:28:48.280 --> 0:28:48.750
Joseph Elliott
Yep.

0:28:47.940 --> 0:28:56.790
Interviewee E
At least not lose sight of 1 big thing when it comes to multipliers, banks or other customers, but the bigger ones by you know by numbers volume.
Life has changed to degree. It's all about a share price.

0:29:3.610 --> 0:29:11.30
Interviewee E
And CEOs and the like have a short to medium term focus on the output of that business.

0:29:11.750 --> 0:29:17.240
Interviewee E
Back in the old days, it used to come a great, great clients and people I met as a youngster and a kid and that when they joined, it was considered back in them days and I'm talking very early 80s. Yeah, this is a job for life.
So people could plan for the long term, but today's world and decision makers are there. There's be blank and honest for the shorter term, so why would you invest in something that you could have to go in retrospectively BIM solely into an existing branch or unit or office that's actually on lease, by the way, invariably cause that's a new model.

0:29:55.940 --> 0:30:4.430
Interviewee E
Why would you go in and smash 10 bells out of it? To create a bin model to achieve very little that have a huge cost up front.

Interviewee E
But over the longer term of its usage, energy saving and the like, you don't know what people don't know

0:30:14.260 --> 0:30:33.110
Interviewee E
Whilst they get it's there, they won't have an appetite to invested it because the model of life and high end business has changed as well. Do you see what I mean? Why would you do it? If someone said to you. Yeah, we're gonna do this long term future. You're in something for 3, 4, 5 years. Ohh. But you gotta spend 100,000,000 to do it.

0:30:33.540 --> 0:30:34.630
Interviewee E
And then this is the problem.
And only save the business hundreds of 1,000,000 after you've gone.

0:30:39.870 --> 0:30:49.390
Interviewee E
I mean every, tender we do, especially in the framework world, the questions always link around what added value have you bought?

0:31:1.90 --> 0:31:1.510
Joseph Elliott
Yeh you hear that a lot.

0:30:50.750 --> 0:31:7.150
Interviewee E
What innovations and technologies can you do? You know, we just had it recently. And it's so difficult some of the stuff you put down there just seems so feeble and lame and you just sort of think but what is there in our world in a in a in a banking environment.

0:31:14.970 --> 0:31:15.240
Joseph Elliott
Yeah.

0:31:7.810 --> 0:31:21.770
Interviewee E
Or in a retail shop environment, what? What game changer innovations are we doing and it's does seem a little bit you write about it, you sort of go it doesn't sound very sexy there.

0:31:22.460 --> 0:31:38.680
Interviewee E
But to me, going forward, the tech, you know the thing over the last few years I've looked at BIM with, with a banking client that, won't work in that in that world. We've looked at lean construction, how can we get better, faster, slicker.

0:31:39.160 --> 0:32:9.850
Interviewee E
Uh, can we? Can we make things? Can we prefabricate off site and bring it in? You know, again it's very difficult because whilst certainly yeah, whilst certainly we tell generally banking and just general retail a lot of the stuff for these customers are the same. The footprint and size of these places are all different. So they've gotta be tailored for each store. So that's so difficult. But yeah, I think it's just going to be simply tech, the immediate tech going forward is gonna be more around digitization now that this whole, you know, people want to see things quicker, they want data quicker. They wanna look at it quicker, they want the answers quicker and that's gonna be wholly linked around digitization and technology linked to sustainability.

Now sustainability is starting to fly and has to fly with the government, the with the government legislations that they brought in. Technology is gonna be linked to sustainability.

0:32:53.140 --> 0:32:54.120
Joseph Elliott
Yeah, yeah. Definitely seeing that more and more
All that stuff.

0:32:40.220 --> 0:32:56.790
Interviewee E
So that for me, they're the two next big technologies in our, in certainly retail that we'll be involved in is digitisation and tech linked to sustainability. Other than that we're continued looking at the other stuff.

0:32:57.480 --> 0:33:1.670
Interviewee E
But I don't see where that will go in. In our retail world.

0:33:2.360 --> 0:33:32.370
Joseph Elliott
Yeah, it's interesting to say that since sustainability and you know in the government backing as well, cause obviously the whole BIM thing that comes back to the government when they were trying to impose them, I think it was it 2016, it had to be something like all projects for government are have to use them and then they failed it and then they pushed it back and then they failed it again and they pushed back and now essentially that along with there's a few reports are quite good that are pretty much the government.

0:33:32.460 --> 0:34:3.40
Joseph Elliott
And we're investing all this money and buy I think it's 2025. We have to have this amount of technology and productivity shown in construction and then it there were way behind all of the targets, then COVID hit and it just everything just disappeared and they almost use that as a big excuse. But actually they were way behind it because of things like retail engine sector and what we're talking about here and the problems you're facing and the fact you can't just get how it works on a big shed somewhere. Therefore it must work on a High Street retail job as well. And I think that's quite a keyword.

0:34:16.730 --> 0:34:17.20
Interviewee E
Yeah.

0:34:10.20 --> 0:34:18.180
Interviewee E
But but the key for me, is that it will only ever work if businesses invest and if customers pay for it. And that is the whole big thing.

0:34:18.310 --> 0:34:24.220
Interviewee E
Yeah, there's not enough money output, margin and return for construction industry led to be the lead in this just isn't because we don't control what we don't control usually.

0:34:30.400 --> 0:34:31.40
Joseph Elliott
Yep.

0:34:31.0 --> 0:34:48.190
Interviewee E
So yeah, it's exactly that. So it always seems like the hands of the wheel going round and round, but I think unless you understood one, I suppose, yeah, you got the direct question. But yeah, I think you need to just understand that the depth, the bandwidth of our industry.

0:34:49.680 --> 0:34:50.60
Joseph Elliott
Yep.

0:34:49.240 --> 0:34:50.810
Interviewee E
What does it really mean?

0:34:52.290 --> 0:34:55.240
Interviewee E
But it's still down to time. Cost money.

0:35:7.920 --> 0:35:8.950
Joseph Elliott
Yep, absolutely.

0:34:56.480 --> 0:35:15.930
Interviewee E
They're the they're the three that there's still those old, that old textbook triangle. That was all that we've all been brought up with is still the main client priorities and until they sign it in their traditional triangle shifts, the technologies and stuff below it.

0:35:18.610 --> 0:35:19.240
Joseph Elliott
…will be Secondary.

0:35:16.680 --> 0:35:20.970
Interviewee E
Always gonna be sort of secondary they are.

0:35:21.440 --> 0:35:21.970
Joseph Elliott
Yep.

0:35:21.940 --> 0:35:23.530
Interviewee E
Until they, until they pay for it. I mean the try the triangle to a degree probably changes now and then it becomes a box and then it becomes. What's the the next one? The five piece piece.

0:35:30.680 --> 0:35:44.130
Interviewee E
Because yeah, because it's people are in there, which is a big obstacle. There's change, which is driven by others, all of them factors. And then suddenly you can create a huge box or whatever.

0:35:44.980 --> 0:35:48.320
Interviewee E
Multi sided you know equation. But there there's no right one fits all. Where's the answer? Where you know? I think a lot of people genuinely have.

0:36:1.420 --> 0:36:5.900
Interviewee E
I think a lot of people genuinely have. A driver commitment, a willingness to change.

0:36:6.680 --> 0:36:9.700
Interviewee E
If they can see the ultimate benefit.

0:36:10.950 --> 0:36:19.290
Interviewee E
But if a customer isn't paying for it, fronting it, and having that driving energy at the start, it then goes back. We're driven by peer now at the end of the day, you know, we got the old parameter life every day is looking after the building blocks of what we do, how we do it, why we do it, dramas unfold and everything. Yeah, but ultimately everybody in our world like the like the what said earlier to the CEO's, the people that invest in it, they're on a short term journey. It's just the way the world is changed. But we are on an annual journey. What's our P&L at the end of it?

0:36:59.540 --> 0:37:0.70
Joseph Elliott
Yeh that does show in some of the decision making and barriers seen.

0:36:48.170 --> 0:37:0.820
Interviewee E
I think because of that I think we tend to overthink technology and innovation. We tend to think of what what's the big, what's the real big game changer thing. Doesn't need to be these one. The best things in life are the smaller ones.

0:37:6.210 --> 0:37:14.360
Interviewee E
But to do even, yeah. But to do that, that's what made when I've got my little finger like that down, you see only the little bits.

0:37:15.470 --> 0:37:26.600
Interviewee E
That then you've got to go back in for the little bit. What are the barriers and the barriers for the big little bits, the bigger bits and big bits that actually probably ain't there, let's be honest.

0:37:32.240 --> 0:37:32.650
Joseph Elliott
Yeah.

0:37:27.410 --> 0:37:42.220
Interviewee E
You still got all the barriers that we've alluded to over the last half hour and maybe we sort of like becomes chicken and egg a little bit and I don't wanna ever come across negative. There is a genuinely great empowerment of people, educated, skilled people.
That bringing all of that into a typical project.

0:37:49.310 --> 0:37:49.490
Joseph Elliott
Yep.

0:37:48.910 --> 0:38:14.660
Interviewee E
With the multifaceted different education driven type people caveman and beyond, I suppose as we alluded to earlier, has it all fit and it's still how much you gonna cost and who's paying for that. Ohh, and then you get the little bit as the fights because everybody's driven by P&L all the way through from a consultant to a client to a CEO to our CEO to all of our business and people.

0:38:24.900 --> 0:38:25.130
Joseph Elliott
Yeah and that's where the fundamental decision making comes in I spose?

0:38:25.240 --> 0:38:28.940
Interviewee E
I suppose cost then would be the biggest cost of people and change.

0:38:30.920 --> 0:38:39.830
Interviewee E
They're adding more different facets to this shape that's just growing and I don't know that how many, what, what's the 27 sided box?

0:38:46.300 --> 0:38:52.770
Interviewee E
So hopefully that's giving you, you got any or you said you had a final question or something, did you or have you got more questions?

0:38:52.330 --> 0:39:17.820
Joseph Elliott
Yeah. No. So without me actually directly asking many of the questions we've spoken about every single one of them. You know, the, the whole, the whole point of it is to get the sides of it to get the realistic approach and the actual experience driven answers rather than just you know there's there's so much out there cause what before I do this I had to do like a literature review which is read all of the information that people have written about.

0:39:31.830 --> 0:39:32.110
Interviewee E
Yeah.

0:39:46.420 --> 0:39:46.650
Interviewee E
Right.

0:39:17.930 --> 0:39:47.540
Joseph Elliott
And there's so much. There's just. Ohhh, yeah. If you exactly what we're saying, if you get this bit of technology, put it in a construction project, brilliant. It's gonna be amazing. It's gonna be best when you guys are done and the actual realistic approach to that just doesn't work. So it's. Yeah, it's always it's good for. For what I'm trying to do to get, you know, the cold hard side of it. That is the reality. So now it's just been pretty much bang on what I needed for all of the answers everything and then yeah really good.

0:39:47.920 --> 0:40:14.480
Joseph Elliott
Many other things are just if you had any tips. So if you if someone came to you and said, you

know, we've got this bit of technology and you look at and you go yeah that that could work, what tips would you give people to try and actually get that get your company to use it. You know in terms of is it communication, is it training, is it you know investment in other sectors or other technologies or anything or just.

0:40:16.410 --> 0:40:17.440
Joseph Elliott
How would you try and do that?

0:40:20.190 --> 0:40:25.740
Interviewee E
I mean, me personally I'm. I mean, I know that we've got a technology part within our company.

0:40:26.960 --> 0:40:47.220
Interviewee E
Personally, I've you know, going forward I could see quite easily there being a bit of a tech hub within purely our world and so we can focus on what we wanna do. You know, we've gotta sustainability team, we've got a, you know, I know that we've got people and they're probably more of the holistic view across he business.

0:40:48.230 --> 0:40:55.470
Interviewee E
it's, it's that sort of bit of a tech hub and I think there's I think we've got some stuff going on again, but more group wide. Can also promote that you know, how can we promote that within the businesses? Cause again it's making sure that at the very beginning is that we don't go all off in different sort of areas or doing. I think the next the next thing the one of the big things that we're all trying to look at and do at the moment is power behind dashboards and everything like that. But I was, I've been speaking with people and the biggest thing that we've got now is more as more and more people get interested in that. They're all gonna have want different things and we're just gonna have dashboard loads and loads of dashboards.

0:41:32.90 --> 0:41:34.410
Interviewee E
The world would be driven by a dashboard.
With with loads of different things, so again it's streamlined.

0:41:36.130 --> 0:41:40.120
Interviewee E
Because then then don't forget the biggest people driver of the dashboard. Is the information being correct in the first place?

0:41:56.320 --> 0:42:8.750
Interviewee E
It's a huge, diverse industry and lots of things. I mean, I like, I like the technology and stuff that we currently have and promote for health and safety reporting and near misses. You may have heard of it as web and all that.

0:42:9.20 --> 0:42:9.670
Joseph Elliott
Yep.

0:42:9.820 --> 0:42:25.320
Interviewee E
You know, we're trying to create controls with snag R, but getting the diversity of the jobs that do, do it well. Those that enter the journey, register it and do nothing. And those that don't even know will snagR, is.

0:42:26.420 --> 0:42:26.720
Joseph Elliott
Yeah.

0:42:27.240 --> 0:42:33.970
Interviewee E
We could go into a mode of train, train three days a week, every day, every week. Of every year.
And absolutely exhaust and create fatigue amongst their people that they won't actually be delivering anything for us to achieve P&L requirements and the constant of that will be people get outed and changed.

0:42:55.400 --> 0:42:59.830
Interviewee E
Therefore, you go you're doing the crab routine going sideways again.

0:43:0.610 --> 0:43:28.40
Interviewee E
You know all the hamster wheel and you know it sounds awful, but the more I look at it and look at the diversity of what we do, the type of people and the mix we have, which we always promote by the way, you know, guys, girls, promotions, you know, next steps put change it, move the people around. Yeah, that, very that's great. It's got good energy to it as well. But I'm trying to think you know.

0:43:28.830 --> 0:43:31.940
Joseph Elliott
It comes becomes a blocker when you're trying to do this so constantly, yeah.

0:43:31.900 --> 0:43:32.190
Interviewee E
Yeah.

0:43:29.240 --> 0:43:40.90
Interviewee E
Little and small changes where does it all go? It gets. It's like the Grand National again. You know. Where are we now we're coming to beaches, Brooks. Probably the biggest obstacle at the end of the day. It's the PNL though.

0:43:40.80 --> 0:43:40.470
Joseph Elliott
Yeah.

0:43:40.810 --> 0:44:5.980
Interviewee E
And just to pick up on the tips for me, I think again it's just summarizing what we said is I don't think we should overthink technology in our world. You know we're not doing huge 50 60 £100 million construction at the ground projects we're doing. We're shopfitters essentially. Yeah, I'll if that's the old term, we don't need to overthink it.

0:44:4.700 --> 0:44:9.320
Joseph Elliott
Yeah, come down to if it's not broken, don't try and fix it?

0:44:20.270 --> 0:44:20.660
Interviewee E
Yeah.

0:44:9.530 --> 0:44:40.680
Interviewee E
I think it's case of tweaking it. You know we obviously wanna become more operationally efficient and commercially efficient and it's just a case of tweaks along the way as opposed to wholesale major sort of technology. I think we I think the key ones for me is going forward standardizing things. So again you know dashboards and in that digital world you know people are gonna have a whole you know gonna all want different needs. But essentially what does the business need and what does the business need to see. Needs to be standardised and to me it's always, you know, and I always come out, this we promoted a back to basics campaign with the commercial team a couple of years ago on the back of an operational efficiency workshop and it's keeping their whilst we wanna progress it's we all must always you know things are only as good as the information that's being pumped into it and we always need to make sure that our that our people and individuals.

0:45:12.150 --> 0:45:29.590
Interviewee E
As good as they are, can always do the basics 1st and then we can grow from that. So we always sort of you know make sure that you know we're covering the basic boxes. You know we're making sure things are completed properly and making cause off that the better data can be gathered.

0:45:33.470 --> 0:45:34.150
Joseph Elliott
Makes sense, yeah.

0:45:33.120 --> 0:45:47.810
Interviewee E
I would and as a final thing though, for me, I would definitely recommend you making approach to the tech team, but I sent him at least an introductory e-mail.

0:45:48.600 --> 0:45:52.790
Joseph Elliott
Yep, I've already reached out to those, so I definitely will work.

0:45:49.360 --> 0:45:56.960
Interviewee E
Because we just, yeah, just just go with them, you know. So you'll get a technical response update from him.

0:45:57.910 --> 0:45:58.560
Joseph Elliott
Yeah.

0:45:59.210 --> 0:46:25.300
Interviewee E
That let's say there's a whole chain that that it, you know, that needs to be covered here. So hopefully it's giving you a bit of a foresight rather than any confusion as to what lies ahead with you in terms of good luck with how you're gonna write that up to in terms of an answer. Because unless you actually get to what the core problem is that the guinea pig, you actually can't create the answer. And if you try to create the answer without looking what the traps are.

0:46:27.170 --> 0:46:28.430
Joseph Elliott
Thats is, yeah.

0:46:37.440 --> 0:46:47.230
Joseph Elliott
Yeah. No, it's, It has been interesting. It's been a good one because it's pretty much everything

I've been reading and researching over the last couple years. There's been sort of reinforced them, backed up or discussed by exactly with what you're saying.

0:46:52.800 --> 0:47:0.310
Interviewee E
Well, hopefully that gives you a bit of a, you know, a bit of a next steps bit of thought anyway,

0:46:58.160 --> 0:47:0.850
Joseph Elliott
Yeah. No, absolutely.

0:47:1.790 --> 0:47:3.470
Joseph Elliott
No, I've really appreciate it

0:47:0.530 --> 0:47:13.290
Interviewee E
Uh, so, yeah, good. Good luck. And if you need to do a follow up at some point across the journey, happy if you wanna just invite, then at least we know follow up. But at some stage that suits say how it goes, yeah.

0:47:13.790 --> 0:47:17.290
Joseph Elliott
No I really appreciate your time. Thank thanks for that and it's been really good.

0:47:18.530 --> 0:47:21.140
Joseph Elliott
Cheers. Right, thanks for the help. Cheers. Cheers.

0:47:17.890 --> 0:47:21.890
Interviewee E
That's a lot. Thanks, Joe. Cheers, man. Bye.

10.9. APPENDIX I

INTERVIEW F – TRANSCRIPT

7th September 2022	22min, 8sec

0:0:0.0 --> 0:0:0.240
Interviewee F
Morning.

0:0:0.10 --> 0:0:1.300
Joseph Elliott
Good morning. Hows things.

0:0:1.560 --> 0:0:1.800
Interviewee F
Yep not bad thanks you.

0:0:2.430 --> 0:0:4.90
Joseph Elliott
Not bad thanks. Right, so I will just start the transcript on teams, youll see it taking notes and dictating what we say, Yeah. So I'll start that now.

0:0:4.470 --> 0:0:4.660
Interviewee F
Yeah. No problem that's fine

0:0:5.350 --> 0:0:23.420
Joseph Elliott
Yeah, so getting straight into it and really question one, how have your experienced implementing or adopting new technology or technologies in your current role and what do you think of the main positives or negatives of, you know, implementing new technologies into businesses?

0:0:25.280 --> 0:0:27.770
Interviewee F
Well, my experience has been pretty positive really.

0:0:28.110 --> 0:0:28.460
Joseph Elliott
Yeah.

0:0:29.400 --> 0:0:37.870
Interviewee F
With both technology and process, I guess my position will ascertain amount of influence with that anyway.

0:0:39.750 --> 0:0:46.620
Interviewee F
But generally over the past ten years I've been with this company and 12 years with the previous tier one contractor

0:0:48.560 --> 0:0:49.550
Interviewee F
Adoption has been pretty proactive, but generally because the business cases built around it shows a return on investment.

0:0:58.500 --> 0:0:59.50
Interviewee F
So from my perspective, it's been pretty positive.

0:1:7.90 --> 0:1:24.780
Joseph Elliott
The they're not too fast. It's fairly generic. Have you found any sort of major or any negatives at all, any things that you know, I suppose not so much been a negative, but things that you've needed to change in the way that you've rolled things out.

0:1:26.220 --> 0:1:31.20
Interviewee F
I think there's always gonna be detractors. There's always gonna be people who do not want to change.

0:1:32.520 --> 0:1:36.610
Interviewee F
Which isn't necessarily a negative, but it's a consideration.

0:1:37.310 --> 0:1:37.570
Joseph Elliott
Yeh.

0:1:37.370 --> 0:1:45.0
Interviewee F
I'm sure you heard some of these before. Cost is always a consideration, whether it be the technology itself or training people in the process.

0:1:47.110 --> 0:1:50.500
Interviewee F
And then the other consideration that some people think is why not think about is the white noise it generates. So if you look at the media.
Like social media LinkedIn. There's already always someone saying something about something, whether it's good, bad or indifferent, and that that can sort of start to wash over you as well. So people get very in different after that, because I say so much of it. You know, it's like advertising it just washes over you in the end and you start ignoring it so.

0:2:17.850 --> 0:2:35.460
Joseph Elliott
No that makes sense. That was one of the things what I tried to do in sort of a lot more research as stay away from BIM because of exactly that, that it is just now become a don't even bother trying to touch the word and the terminology because it's been so heavily talked about that it becomes a bit of a trigger.

0:2:35.70 --> 0:2:37.300
Interviewee F
Yeh, It's been abused.

0:2:36.330 --> 0:3:5.170
Joseph Elliott
Yeah., absolutely. Yeah, you say BIM and in peoples minds, they think, I know it doesn't really do much because it's the best thing I've got 3D model. They're not, you know, they don't understand it. And that's half the problem with a lot of this stuff is not understanding it because of the training or the communications.

0:3:6.210 --> 0:3:6.610
Interviewee F
Yes.

0:3:8.90 --> 0:3:14.410
Joseph Elliott
So when you actually look into adopt A new technology, you know you've got something in you're about to sort of relate to the business, what would you consider the key SuccessFactors to be to actually get it in and you know, ensure that it's actually been implemented well.

0:3:25.310 --> 0:3:32.900
Interviewee F
Uh, as a business case, you gotta do your do diligence on it. So any existing case studies from any competitors is useful.

0:3:34.0 --> 0:3:38.170
Interviewee F
Any test pilots or or pilot schemes that you've done yourself?

0:3:38.570 --> 0:3:38.910
Joseph Elliott
Yep.

0:3:39.50 --> 0:3:44.240
Interviewee F
Or proof of concepts is key as well and then getting the financials to stack up.

0:3:45.210 --> 0:3:51.270
Interviewee F
You know, because it's time, time and money and time is money. So it's basically money.

0:3:51.660 --> 0:3:51.980
Joseph Elliott
Yeah.

0:3:52.410 --> 0:3:55.980
Interviewee F
Yeah. So you got, you gotta prove an all round case with it. Really.

0:3:56.370 --> 0:4:5.20
Joseph Elliott
Yeah. And is there any specific things which you do things or any specific priority in which you would then look at those actual factors?

0:4:6.100 --> 0:4:12.310
Interviewee F
But they're all equal priority. I would say that they all they all create part of that one big.

0:4:13.470 --> 0:4:17.250
Interviewee F
Business case that that you're trying to push across or implement.

0:4:18.50 --> 0:4:18.300
Joseph Elliott
Yeah.

0:4:19.110 --> 0:4:27.70
Interviewee F
And each has its own important. So you know, case studies are important on, you know, even lessons learned where people are doing it right or people are doing it wrong as well.

0:4:27.830 --> 0:4:34.660
Interviewee F
Or does it work for them and not for us or vice versa? Does it work for us and not for them? So there's lots of different things to consider.

0:4:36.290 --> 0:4:49.650
Joseph Elliott
And then you mentioned obviously competitors and stuff like using the same stuff is the knowledge Paul quite accessible between companies or is it you know it's a hard to find out what people's experiences are or?

0:4:50.520 --> 0:4:54.410
Interviewee F
Again, I would say that that's dependent on who you know. Fortunately, I've been doing this a lot of a lot of years, so I know a lot of people.

0:5:2.190 --> 0:5:2.550
Joseph Elliott
Yeah.

0:5:2.700 --> 0:5:5.290
Interviewee F
So getting that sort of information isn't too tricky.

0:5:7.250 --> 0:5:13.420
Interviewee F
But other others might struggle with that. It just it's on your contact basis and it's you know like any business.

0:5:19.550 --> 0:5:19.860
Joseph Elliott
Yeah.

0:5:15.30 --> 0:5:27.540
Interviewee F
Over the years or four years doing this. So. So you build up a big contact base. So I know most of the other directors or leads within the digital arenas of other the tier one, so obtaining that information isn't too tricky, and that's it on a lot of construction boards and things like that as well. So you, you meet up with your peers.

0:5:36.150 --> 0:5:36.460
Joseph Elliott
Yeah.

0:5:37.320 --> 0:5:42.200
Interviewee F
But you know, any knowledge gained whether it's good, bad or indifferent, is good knowledge.

0:5:43.30 --> 0:5:44.370
Interviewee F
As you can then act upon that.

0:5:45.80 --> 0:6:6.290
Joseph Elliott
Yeah, the reason I asked is It's quite another part of this is the bias and companies selling their technologies, you know they're all gonna come to you and tell you ohh we've done it with so and so and it's the best thing that's ever happened. But try and actually disseminate that and try and understand what cut for it all and really understand is it true or not nothing that's quite ok.

0:6:17.640 --> 0:6:18.10
Joseph Elliott
OK.

0:6:8.920 --> 0:6:22.590
Interviewee F
Yeah, yeah. Demos are all you know about one thing, but we tend to try and do proof of concept demos so that they take two or three months. So you live with it a bit more day-to-day and then then then you can sort of shake out the problems. But.

0:6:23.90 --> 0:6:23.390
Joseph Elliott
Yeah.

0:6:23.730 --> 0:6:36.590
Interviewee F
Like you say, I mean, no exaggeration. I probably get one or two approaches a week from a different vendor saying this is the best thing. Come and have it and it's like, no you we have to stop that and hang your hat on one particular product.

0:6:37.140 --> 0:6:37.480
Joseph Elliott
Yeah.

0:6:37.590 --> 0:6:40.30
Interviewee F
Otherwise you'll be chasing the towel for the rest of your life.

0:6:44.970 --> 0:6:45.470
Joseph Elliott
Yeah.

0:6:41.660 --> 0:6:50.710
Interviewee F
Yeah, same as same as iPhones and Galaxy, whatever they are version whatever. You know you buy a iPhone 13 and then next year it will be a 14 and then the 15 and so on.

0:6:51.400 --> 0:6:53.400
Joseph Elliott
I bet its always the best thing that's ever come out.

0:6:53.510 --> 0:6:55.460
Interviewee F
Exactly. And where do you stop? Where do you stop?

0:6:55.270 --> 0:7:17.20
Joseph Elliott
Yeah, no, I get that. So typically is the technology adoption driven by issues that are brought to you like is there a sort of an issue that's raised you that are we need something to solve this or as you say, is it companies coming to you with, we've got the solution to everything and then you've just gotta try and you know pick the right ones.

0:7:24.750 --> 0:7:25.20
Joseph Elliott
Yep.

0:7:18.180 --> 0:7:27.570
Interviewee F

Probably both of those you probably get a shiny solution for something that you didn't realize you wanted and then vice versa. People say I've got this consistent problem.

0:7:28.460 --> 0:7:31.740
Interviewee F
What? How can we? How can we fix that? So it's a bit of both.

0:7:32.210 --> 0:7:32.440
Joseph Elliott
Yep.

0:7:41.60 --> 0:7:52.920
Joseph Elliott
The next one is really any specific key factors to retail.

0:7:54.150 --> 0:7:58.100
Interviewee F
Off the top of my head, you might want to speak to ***** or *****.

0:8:4.290 --> 0:8:16.190
Joseph Elliott
And then in your experience, what do you believe are the key SuccessFactors and barriers that relate to implementing specifically within construction companies, you know, something that maybe I suppose start with the actual the key barriers, and then if you think that they would be different in you know other industries, other companies that are specific to construction.

0:8:29.450 --> 0:8:34.360
Interviewee F
Yeah, probably the biggest barrier is culture and people not wanting to change.

0:8:35.590 --> 0:8:40.120
Interviewee F
That's a tough one that can go by age demographic as well. So you know you drop down to the 30 year olds or sub 30s that they were born with an iPhone in their hands. So they don't mind technology. First of all, but then other construction person, I've been doing this for 20 years. I'm not changing so. You know that that cultural piece is really important.

0:9:0.810 --> 0:9:7.510
Interviewee F
And I suppose off the back of that is, is that educational piece you mentioned earlier as well, people not fully understanding what it is?

0:9:10.770 --> 0:9:12.40
Joseph Elliott
Did you think that causes problems?

0:9:10.580 --> 0:9:15.760
Interviewee F
Because you see, you said abit. BIM conjures up one thing and one thing only. Where actually it, it's massive.

0:9:16.130 --> 0:9:16.400
Joseph Elliott
Yep.

0:9:18.200 --> 0:9:21.80
Joseph Elliott
And you think that comes from the education?

0:9:21.800 --> 0:9:27.190
Joseph Elliott
There are specific to people or do you think that's more individuals own experience of things?

0:9:28.650 --> 0:9:30.760
Interviewee F
I think it's probably individuals own experience.

0:9:31.480 --> 0:9:31.720
Joseph Elliott
Yeah.

0:9:32.60 --> 0:9:33.270
Interviewee F
After I think you must settle on something within the 1st 5 seconds of hearing it, don't you? And I'll say BIM and 3D and it's like it's not actually. It's a very slim percentage of it, but.

0:9:45.10 --> 0:9:49.280
Interviewee F
You know that's where that sits. And then I suppose the other one is perceived cost as well.

0:9:50.30 --> 0:9:50.350
Joseph Elliott
Yep.

0:9:50.660 --> 0:10:1.690
Interviewee F
I don't like look at upfront capital costs at the CapEx rather than the OpEx and the return on investment. So yeah, it might cost you 10 grand to invest and get this going, but actually it's gonna save you 50 grand a year.

0:10:2.850 --> 0:10:3.110
Joseph Elliott
Yeah.

0:10:7.270 --> 0:10:10.860
Joseph Elliott
Life cycle costs as well, rather than just the up front and the shell.

0:10:11.690 --> 0:10:18.580
Interviewee F
Yeah, exactly. That. Where where's the value? Where's the determined value? People don't know. Don't always ask that question to themselves.

0:10:19.350 --> 0:10:19.600
Joseph Elliott
Yeah.

0:10:20.330 --> 0:10:23.890
Interviewee F
I think the value is the cost of the product. It's not. The value is what the product delivers.

0:10:26.650 --> 0:10:36.380
Joseph Elliott
No, that's it. And that's that's one of the big things that's come up is obviously it's, it's an investment, it's not a, you know, we're gonna put this much in and within a weeks time you'll you'll get it all back. It's very much The long game.

0:10:38.470 --> 0:10:38.830
Interviewee F
Yes.

0:10:45.320 --> 0:11:5.140
Joseph Elliott
OK, so if if you were presented with a new technology now or in the future, what would be the methods of looking to successfully adopt that? So like the sort of step by step how you take it for first financial sign off and then actually implement it, you know making sure that everyone in the

0:11:5.910 --> 0:11:10.120
Interviewee F
Yeah. So again, it'll be back to a proof of concept trial.

0:11:10.870 --> 0:11:12.250
Interviewee F
However, many months that would be to gain some statistics and results off of that.

0:11:17.990 --> 0:11:18.380
Interviewee F
Then Financials and commercial viability.
And then from there you get a resource plan generated from. From your implementation plan.

0:11:30.700 --> 0:11:34.460
Interviewee F
Yeah. And then how you're gonna develop that and realistically roll it out?
Started company so just for an example, we're just adopted construction cloud.

0:11:45.370 --> 0:11:45.650
Joseph Elliott
Yep.

0:11:45.600 --> 0:11:46.740
Interviewee F
An enterprise agreement. So when that went upstairs to get signed off, this is a three-year plan to implement it. So it's not a quick win.

0:11:54.450 --> 0:11:54.700
Joseph Elliott
Yeah.

0:11:55.490 --> 0:11:56.720
Interviewee F
Yeah. So that's three years.

Yeah, I've got people being employed to run this. So there's a consideration on it. You know, the resource that actually runs it and then the spinner people that support it so.

0:12:7.230 --> 0:12:7.540
Joseph Elliott
Yep.

0:12:7.980 --> 0:12:15.350
Interviewee F
It it's bigger than just ohh, it's a piece of software and it costs X. It's actually what goes into the backbone and and the support mechanism that sits behind it.

0:12:16.300 --> 0:12:16.990
Joseph Elliott
OK. Yeah.

0:12:18.750 --> 0:12:21.640
Interviewee F
So it's very much a strategic implementation.
Which some people some people don't see that.

0:12:26.180 --> 0:12:35.710
Joseph Elliott
Yeah. So the cost of the technology could be X, but actually there's a load behind it of the management not necessary of the technology but of actually getting people to use it, you know.

0:12:35.910 --> 0:12:37.70
Interviewee F
Yes. Yeah.

0:12:38.140 --> 0:12:41.10
Interviewee F
But you know the returns will only show in probably year 3.

0:12:42.370 --> 0:12:45.100
Interviewee F
Yeah, yeah. One and two is, is is really your burn.

0:12:49.570 --> 0:13:6.470
Joseph Elliott
And then the actual team of the resource board, trying to implement and things like that, is that a stage approach of, you know, testing within the business, you know, giving outcomes and stuff? Or is that very much a once it's actually been implemented on people need to start using it?

0:13:7.500 --> 0:13:9.770
Interviewee F
Spit both, really. So we did some pilots on it for the past couple of years. I think we've now got 7 projects on it and once I'm manager starts next month, we're then get up to speed and we'll do some comms on that company wide so.

0:13:21.910 --> 0:13:30.660
Interviewee F
The trick is not to put the comms out before he got the resource in place. Otherwise you could be selling something that you haven't physically got.

0:13:31.330 --> 0:13:35.340
Interviewee F
Yeah. So then you'd get overwhelmed and it would collapse in the first instance, so.
You have to be a bit clever with the way you advertise and sell. Sell your.self if you like, because I could start hard selling now and then we'd get a flood of inquiries and then not be able to support it. So it it will collapse before it starts.

0:13:52.250 --> 0:13:52.570
Joseph Elliott
yeh.

0:13:51.730 --> 0:13:53.790
Interviewee F
So slowly, slowly, catchy monkey.

0:13:54.60 --> 0:14:9.410
Joseph Elliott
Yeah. No, that's really interesting. I'm really thought about that aspect of, you know, about conceive been battling with, how do you get everyone to use it. But actually the other side of if everyone goes, yeah, we wanna use it. How do you then manage that in terms of making sure it doesn't fail?

0:14:10.370 --> 0:14:31.230
Interviewee F
Yeah, but the three-year business as usual, we've got a scaled approach. So year one is X year two is X + X and then year three is X + X + y. So you've got a tiered approach. Yeah. So the people who have learned it in year one then continue using year 2, but then you're training another X. So you're not not gonna flood yourself, yeah.

0:14:31.240 --> 0:14:31.490
Joseph Elliott
Yeah.

0:14:32.290 --> 0:14:34.490
Interviewee F
So yeah, you gotta be very wary of that.

0:14:39.280 --> 0:14:49.300
Joseph Elliott
And then those that sort of management team and stuff as well, they deal with the blockers. So I suppose is that right? So like if you do get you know for whatever reason people.

0:14:49.990 --> 0:14:56.870
Joseph Elliott
Not wanting to use it, would it be up to them to then try and you know, do the training, do the comms and push it through?

0:14:58.250 --> 0:15:4.20
Interviewee F
Well, I think once you've got business backing for something, it's a lot more difficult for people to say no. Because if the message is coming from above.
It it gives you a bit more weight behind it.

0:15:10.780 --> 0:15:11.130
Joseph Elliott
Yep.

0:15:11.290 --> 0:15:21.240
Interviewee F
So that, you know, another part of this strategic plan is to get that in place, you know, like we're just pretty much concluding business planning and this this is integrated into it, so.

0:15:21.970 --> 0:15:22.200
Joseph Elliott
Yeah.

0:15:22.250 --> 0:15:25.200
Interviewee F
Hopefully that that removes blockages as well.

0:15:29.240 --> 0:15:33.190
Joseph Elliott
Yeah, people almost being told you've gotta use it. So do it right.

0:15:40.200 --> 0:15:51.670
Joseph Elliott
OK, the next one then is if you were to give advice to another contractor who's looking to implement a new technology, what 3 tips would you give them to make sure they're successful?

0:15:53.990 --> 0:15:55.480
Interviewee F
Do your do diligence

0:15:56.480 --> 0:15:56.800
Joseph Elliott
Yeah.

0:15:58.10 --> 0:16:2.650
Interviewee F
On the on the vendor themselves on the use of it, who's used it?

Whether it's truth or part fabrication.

0:16:7.770 --> 0:16:8.20
Joseph Elliott
Yeah.

0:16:9.450 --> 0:16:22.760
Interviewee F
And then find out the costs as well, because the cost can escalate quite rapidly with some vendors that they sell you a lost lead for year one and then make it up year 2, 3, 4.

0:16:23.450 --> 0:16:24.810
Interviewee F
With a price hike.

0:16:25.360 --> 0:16:25.730
Joseph Elliott
Yeah.

0:16:25.640 --> 0:16:26.430
Interviewee F
So You know with the one we've just done, we've done the three-year buy in. So we're locked in for three years. And then with not quite a guarantee, but with maybe an 88 to 10% increase in year four, which is manageable, but we've seen some that have doubled, even tripled. Without any lock in so. I'd say look at the financials and make sure that that the commitment is there from both sides.

0:16:53.590 --> 0:16:53.880
Joseph Elliott
Yeah.

0:16:55.330 --> 0:16:56.660
Joseph Elliott
Sounds like an energy company.

0:16:57.370 --> 0:16:57.820
Interviewee F
Yes.

0:16:58.900 --> 0:17:1.290
Interviewee F

What everyone's working on these models now so. You know this, this scalable model when it goes on the company turnover rather than how many licenses you have now, so Uh, not really. Just do your checks. It it's very easy to get drawn into all the sparkly bits and the shiny bits.

0:17:26.310 --> 0:17:28.360
Interviewee F
You know when we checked into some of the a couple of vendors last year stating there were using artificial intelligence. They weren't, they were using and after the country with a lot of people in it, just to press all the buttons overnight so. Yeah, you have to be very careful with certain things.

0:17:44.240 --> 0:17:48.580
Joseph Elliott
Yeah. And then so does that go then go back to what you were saying earlier about, you know check in with other contractors other school experiences and that sort of thing. So again, it's all ties back into in a way, the sort of good people that are managing this and their experience and expertise.

0:18:4.180 --> 0:18:9.620
Interviewee F
Yeah, yeah, all of that, you know, and security aspects of it as well is it, is it fit for purpose?

0:18:10.190 --> 0:18:10.430
Joseph Elliott
Yeah.

0:18:16.520 --> 0:18:17.210
Joseph Elliott
That makes sense.

0:18:17.910 --> 0:18:23.830
Joseph Elliott
Umm. And then the last one then is pretty much just. If there's anything else, any sort of. Research or any other people you know that would be a good thing, good place to sort of look up in terms of this in terms of like the adoption and.

0:18:34.340 --> 0:18:35.690
Joseph Elliott
Where to go next, really?

0:18:38.20 --> 0:18:40.490
Interviewee F
I don't know. I don't know how many more people you wanna interview.

0:18:40.870 --> 0:18:43.440
Joseph Elliott
To be fair on probably towards the end of the line.

0:18:44.150 --> 0:18:44.510
Interviewee F
Yeah.

0:18:44.900 --> 0:18:52.710
Joseph Elliott
Yeah, I say I've done quite a few. And like I say, I was mainly focused on the retail side of things. So I've got through quite a few of them.

0:18:53.210 --> 0:18:59.140
Interviewee F
Yeah, I don't think anyone else I'd recommend would probably give you anymore value to what you got there. Probably very similar answers so.

0:18:59.140 --> 0:19:1.80
Joseph Elliott
Yeah. Yeah. No, that's fair enough.

0:19:4.720 --> 0:19:5.30
Interviewee F
Good.

0:19:3.20 --> 0:19:5.280
Joseph Elliott
No, thanks that's amazing.

0:19:5.930 --> 0:19:7.640
Interviewee F
Yeah, I said. We like it nice and easy.

0:19:7.940 --> 0:19:11.240
Joseph Elliott
Yeah. Yeah. No, really appreciate your time on this.

0:19:11.540 --> 0:19:12.100
Interviewee F
That's alright.

0:19:12.510 --> 0:19:18.550
Joseph Elliott
Yes, really helpful and yeah, now I just have to go away and start reading all of these now and put it together, yeah.

0:19:18.490 --> 0:19:19.920
Interviewee F
Yeah. When's that gonna be submitted?

0:19:20.280 --> 0:19:22.220
Joseph Elliott
End of the year, December.

0:19:21.500 --> 0:19:25.910
Interviewee F
What's that for? Is that is that a M Phil or something or what?

0:19:24.120 --> 0:19:37.430
Joseph Elliott
So Its an MPhil, so masters. Saying. Yeah, yeah. Did it started off three years ago. It was a PhD and then just got way out of hand with working as well. So I dropped it down to it an MPhil

0:19:44.950 --> 0:19:45.260
Interviewee F
Good.

0:19:38.870 --> 0:19:47.730
Joseph Elliott

Yeah, it should come out and getting different answers. They're all pretty much what's what I'm expecting. So it's so it's all good, really. And then yeah.

0:19:48.990 --> 0:19:49.340
Interviewee F
All right.

0:19:50.110 --> 0:19:51.700
Interviewee F
Well, if you need any other help, let us know.

0:19:52.140 --> 0:19:56.130
Joseph Elliott
Yeah, appreciate that. Thanks. thanks for your time. Really helpful.

0:19:55.650 --> 0:19:57.810
Interviewee F
Yeah, no problem. Alright, well, good luck.

0:19:58.390 --> 0:20:0.950
Joseph Elliott
That's all I have. Just the afternoon back. Cheers.

0:20:0.210 --> 0:20:4.500
Interviewee F
Yeah, yeah. If you get any trends out of that, just let us know, yeah.

0:20:4.750 --> 0:20:8.170
Joseph Elliott
Yeah. Yeah, will do, yeah. I'll probably end up issuing it out once we're done. Just.

0:20:10.130 --> 0:20:14.110
Interviewee F
Yeah. OK, great. Thanks very much. Cheers. Bye, bye.

0:20:11.890 --> 0:20:14.140
Joseph Elliott
Nice one. Thanks so much. Cheers.

10.10. APPENDIX J

ETHICS APPROVAL

Ethics Application and Approval.pdf

Ethics ETH2021-0212: Mr Joseph Elliott (Class 1)

Researcher	Mr Joseph Elliott
Project	THE APPLICATIONS OF ADVANCED TECHNOLOGIES IN UK RETAIL AND FIT-OUT CONSTRUCTION PROJECTS AND THEIR REAL-WORLD EFFECTS ON PRODUCTIVITY IN PROJECT DELIVERY.
College	Westminster Business School
School	Applied Management

Ethics application

Proposal

Project title

THE APPLICATIONS OF ADVANCED TECHNOLOGIES IN UK RETAIL AND FIT-OUT CONSTRUCTION PROJECTS AND THEIR REAL-WORLD EFFECTS ON PRODUCTIVITY IN PROJECT DELIVERY.

1.1 Please provide a description of the background with references to relevant literature (250 words)

The purpose of the survey and interviews are to establish from the users experience and knowledge, the real world effects of technology applications on productivity in project delivery and subsequently project success rates.

The pilot survey will help guide the research and aid in refining the questioning and sample groups required for the wider PhD thesis that is currently in development. Further to this pilot survey, more detailed qualitative interviews shall be undertaken, the results of which -combined with the results from this pilot survey - will form the foundation of the analysis and conclusion of the thesis.

The questionnaire will focus predominately on mixed reality (VR and AR) applications, paperless technology (cloud based applications such as BIW, Aconex, SnagR, MS 365 etc.) and off-sit 3D printing technology.

1.2 Please provide a brief description and the aims of your study (250 words)

The research aim is to investigate and evaluate how advancements in technology are being utilised within the UK Retail and Fit-Out Construction sectors and how specific technologies are providing contractors with a tool to increase productivity on site. To further analyse the benefits of real-world implementation of Cloud-based Information Sharing, Augmented Reality and 3D off-site Fabrication applications on projects and whether this can correlate to productivity increase.

1.3 Please outline the design and methodology of your study and details of any invasive or intrusive procedures (400 words)

The methodology proposal is a mixed methodology approach with an initial pilot survey being utilised for both influence in further development of the open ended interview questions, whilst also being analysed as predominately quantitative data for conclusions against the research aims. The

interviews will then be an open style interview with prompt questions to produce qualitative responses for critical review and analysis. A final comparison between the pilot survey and interview questions will then be undertaken to establish correlations and draw final conclusions from the results.

1.4 Start date
03 Aug 2020

1.5 End date of work
30 Apr 2021

External factors

2.1 Does your research include links with external organisation(s)?
No

2.2 Are you seeking ethical approval from the Health Research Authority (HRA)?
No

2.2.1 Are you seeking University sponsorship (as defined by Health Research Authority)?
No

2.3 Are you seeking ethical approval from any other external organisation (which is not the Health Research Authority)?
No

2.3.1 Select one option:

2.4 Have you been asked by an external organisation to produce evidence of ethical approval for your research?
No

Participants

4 Does this research proposal (as proposed to Research Ethics Committee in its current status) include Research Participants (humans and/or animals, either deceased or alive)?
Yes

5 If your research fieldwork (virtual or in person) will not be carried out on University premises, please state the location of your research.

Location

Region
London

Country
United Kingdom

Part A

6.1 Will any pain or more than mild discomfort result from the study?
No

6.2 Could the study induce any psychological stress or anxiety or cause harm or negative consequences beyond the risks encountered in normal life?
No

6.3 Will the study involve prolonged or repetitive physical or psychological testing of human participants that may put someone at risk, e.g. use of treadmill?
No

6.4 Will the study involve raising sensitive topics (e.g. sexual activity, drug use, revelation of medical history, bereavement, illegal activities, etc.)?
No

6.5 Does your work involve relevant material, defined by the Human Tissue Act as material other than gametes, which consists of, or includes, human cells. In the Human Tissue Act, references to relevant material from a human body do not include: (a) embryos outside the human body, or (b) hair and nail from the body of a living person.
No

6.6 Will DNA samples be taken from human participants?
No

6.7 Does your study raise any issues of personal safety for you or other researchers or participants involved in the project (especially relevant if taking place outside working hours or off-site e.g. not on University premises)?
No

6.8 Does your study involve deliberately misleading the participants (e.g. deception, covert observation)?
No

6.9 Does your work involve administration of a food or non-food substance of a different type from or in abnormally higher or lower amounts than normal or one that is known to cause allergic reaction(s) or potential psychological stress?
No

6.10 Does your study involve issues relating to personal and/or sensitive data?
No

6.11 Does your research involve any 'security sensitive material?
No

6.12. Does your research ethics proposal include off-site (i.e. not on University premises) research fieldwork and travel involving face to face interactions?

Participants

7.1 Human participants in Health and Social Care settings?
No

7.2 Human participants who may be deemed vulnerable due to their setting(s)?
No

7.3 Expectant or new mothers?
No

7.4 Refugees or asylum seekers or recent migrants?
No

7.5 Minors (under the age of 18 years old)?
No

7.6 Participants in custody (e.g. prisoners or arrestees)?
No

7.7 Participants who may potentially fall under the remit of the Mental Capacity Act
No

7.8 Animals (or animal tissue)?
No

Information to participants

8.1 Will you provide participants with a Participant Information Sheet prior to obtaining informed consent ?
Yes

8.2 Will you describe the procedures to participants in advance, so that they are informed about what to expect?
Yes

8.3 Will you obtain informed consent for participation (normally written)?
Yes

8.4 Will you tell participants that they may withdraw from the research at any time and for any reason?
Yes

8.5 Will you give participants the option of omitting questions they do not want to answer?

Yes

8.6 Will you tell participants that their data will be treated as confidential and that, if published, it will not be identifiable as theirs?
Yes

8.7 Will you offer feedback to participants at the end of their participation, upon request (e.g. give them a brief explanation of the study and its outcomes)?
Yes

Attachments

Upload any additional files to support your application which have not already been uploaded within your application. For instance, Participant information sheet, Consent form, Photographic/video consent form, Indicative questions sheet, Insurance cover, Security sensitive research assessment, Health and Safety Risk Assessments, COSHH, Ionising Radiation, Display screens etc.

Attached files

PhD Interview Questions_First