

A Critical Evaluation of the Need for Technology Disruption within the UK Residential Mortgage Market

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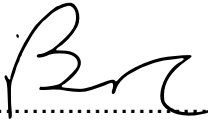
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3 Declarations and Statements

DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

Signed  (candidate)
Date 10 May 2020

STATEMENT 1

This work is the result of my own investigations, except where otherwise stated.

Other sources are acknowledged by footnotes giving explicit references. A bibliography is appended.

Signed  (candidate)
Date 10 May 2020

STATEMENT 2

I hereby give consent for my work, if accepted, to be available for photocopying and for inter-library loan, and for the title and summary to be made available to outside organisations.

Signed  (candidate)
Date 10 May 2020

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5 Abstract

This study set out to understand the need for a technological paradigm shift in the UK residential mortgage market, with the overall aim of this study is to address the perceived gap between the available disruptive technology and the technology that is being used in the mortgage market. With an aim to evaluate the competitive advantage (Porter, 1985) that technological disruption will give lenders and brokers.

Initial research indicated that there was some interest from the industry about pursuing “robo-advice” and other technologies (IRESS, 2018), it appeared that consumers also had some appetite for utilising technology in the process (Clark, 2018).

Primary research was carried out through two separate surveys. The first survey was qualitative and asked 50 mortgage professionals about their awareness of emerging technologies, and the difficulties they were aware of in the mortgage application process.

The second survey was a quantitative survey that asked 1000 recent mortgage consumers about their experience with applying for a mortgage. Additionally, they were asked how the process compared to other financial products they had applied for.

Our quantitative survey showed that the vast majority of mortgage customers engaged with the process through traditional means, with 42% of consumers completing the application through paper forms, and another 46% handled the transaction by email. Additionally, 49% of consumers found the process either “complex” or “very complex”.

This result corroborates the perceived wisdom that the mortgage process was painful, and the qualitative survey of mortgage professionals provided additional clarification about some of the difficulties in the process, in particular related to the administrative burden.

This study concludes that mortgage advisors are undertaking the bulk of the administrative process, and do not have the resources to invest in technology. This is resulting in a lag between technology being available and it being widespread in the industry. This study recommends that FinTech firms that are able to automate the administrative burden, will be able to derive competitive advantage.

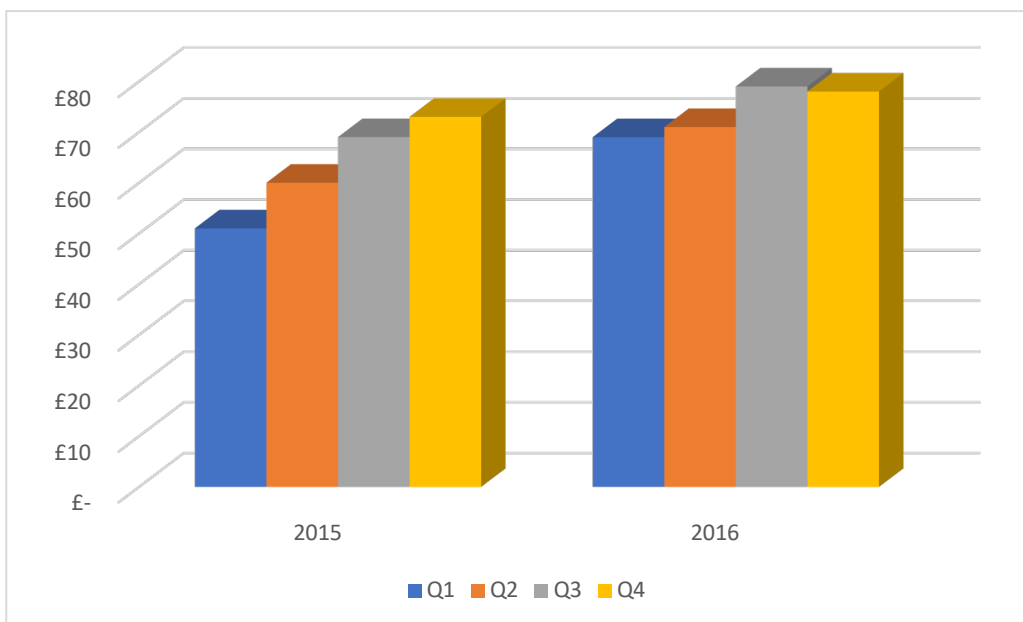
6 Introduction

The introduction section of this study first provides the relevant context for the critical discussion of the need for a technological disruption in the UK residential mortgage market. Following the background information, the study outlines the research aim, the research question of the study, and the objectives, together with their justifications. The introduction section then closes by highlighting the contribution of this research to the wider business field.

6.1 Background

With approximately 8 million regulated first-charge residential mortgages in the UK, valued at a minimum of £1 trillion as of 2016, the UK residential mortgage market is one of the largest financial markets in the retail sector (FCA, 2018).

Figure 1. UK Gross residential mortgages by quarter (Q1 2015 – Q4 2016)



Source: FCA (2018).

Regulation in the mortgage sector, especially after the 2008-2009 financial crisis represents a major obstacle in the path of technological innovation in the financial sector, given the creation of the Financial Conduct Authority (FCA) in 2013, which ensures that consumers of financial services get a fair deal, financial markets in the UK are protected, and they work effectively and competitively in the best interest of consumers (FCA, 2016). To gain some

perspective on the level of reach of the FCA, the regulator looks after the conduct of 58,000 financial services firms and financial markets in the UK (FCA, 2016).

However, more recently, a new approach has been experimented with, called regulatory sandbox, whereby regulators and firms or third-party providers of financial services can collaborate on new technologies in a controlled environment. One such example is the UK FCA and the Dutch Authority for the Financial Markets (AFM)/Dutch National Bank (DNB) collaboration which works as a regulatory sandbox (AFME & PwC, 2018).

Moreover, the EU regulation on data protection in the UK which was implemented in 2018, known as GDPR, introduced additional consent forms for consumers' sensitive personal data collection, storage and processing (UK Gov, 2018). In addition, GDPR, with its regulatory requirements in terms of personal data protection rules, has a significant impact on Financial Technology (FinTech) firms given, for instance, the large adoption of biometrics as identifiers for financial transactions, or customers' right to get hold of their data and ask companies to delete their personal data from servers (Signaturit, 2018).

In terms of the residential mortgage sector, according to the FCA (2018), customers receive personalised financial advice from the institutions that lend them the money, or from a regulated third-party, for approximately 80% of all regulated mortgage transactions. This is a legal requirement for almost all new residential mortgages, unless customers choose to remortgage with the same provider (FCA Handbook, 2019), in which case the transactions could be processed without the customer receiving advice.

Therefore, the discussion around the need for a disruptive change in technology in the UK residential mortgages market is worth focusing on, since it sheds some light on a paradox that is taking place in the UK financial market. In spite of a rapid technological advancement in some areas like electronic or online banking (Chou & Chou, 2000), the residential mortgage sector in the UK has seen a slowdown, at least since the 2008-2009 global financial crisis due to its roots in the retail industry.

The process of applying for a mortgage in the UK has remained relatively unchanged for years, requiring manual paperwork and involving long processing times (Bookallil & Birkby, 2017). By contrast, other large financial transactions, such as applying for personal loans, enjoy automated processes (IRESS, 2018). Coupled with the growing number of consumers of financial products who utilise technology for their financial transactions on a daily basis, the need for a paradigm shift in the mortgage application and approval processes is more relevant than ever.

The question that arises, then, is what technology disruptions are available out there. Some of these opportunities include the use of artificial intelligence (AI) in the automation of residential mortgage application processing, the use of robo-advice to provide online financial

advice acting as a mortgage broker, or digital intermediaries, open banking or blockchain technology (IRESS, 2018).

The Intermediary Mortgage Survey Report 2018, based on a survey including 417 brokers in the UK, shows that over a third of respondents expressed the need for more intuitive and user-friendly portals for customers, which would not be, however, a disruptive technology, but rather an improvement on existing tools (IRESS, 2018). Nonetheless, 20 per cent of respondents said that they would or possibly would implement a robo-advice in the next 12 months. In addition, 14 per cent of mortgage brokers manifested an interest in robo-advice technology alongside developments in financial AI, as a method to help increase the efficiency and consistency of fact finding for product search processes (IRESS, 2018).

Furthermore, robo-advice technology could also be helpful from the perspective of homeowners. A 2018 survey conducted by Which? on 3,000 mortgage holders revealed that 22 per cent of the respondents find it helpful to compare the deals they can find themselves with what the online broker is offering, whilst 18 per cent feel less pressured into applying for a mortgage when they have the option to simulate an application online than having a face-to-face or telephone conversation (Clark, 2018).

As it stands, there is a gap in the research around the need for technological innovation in the UK residential mortgage market, despite the rich body of knowledge on disruptive technology, as well as on its impact on the financial services sector as a whole. The term disruptive technology was coined by Christensen (1997) who pointed out the conflict of interest which is generated when new players capture market shares by identifying and serving new customer needs, as they introduce a technological innovation, whilst existing players heavily rely on well-known technologies serving presumed needs of customers.

Finally, in order to understand where the UK residential mortgage market is situated in terms of its needs of technology disruption, the current research study would not be complete without a look at other countries, and without trying to learn from their own experience. For instance, one such case is Germany, where Hirsch-Kreinsen (2011) analyses the transformation process of the German innovation system, in relation to the financial market. Another innovative country is the Netherlands, where Veuger (2018) explores disruptive blockchain technology for the real estate sector and addresses the question whether blockchain is only a technological disruption, or is it here to stay, by changing the entire value chain of the real estate market.

6.2 Research aim

Whilst the focus of this research is on the UK residential mortgage market and the argument for the need of a technological paradigm shift in this area, the overall aim of this study is to address the perceived gap between the available disruptive technology and the technology that is being used in the mortgage market. This will ensure that the research question which has been set out for this study, as outlined below, will be answered.

6.3 Research question

Given the focus of this research on the need to technology disruption within the UK residential mortgage market, and the research aim outlined above, around the perceived gap between available technological innovation and the actual technology used in the UK residential mortgage market, the actual question this study is trying to answer is the following:

RQ: In what ways is technology a driver for change in the UK residential mortgage market?

This research question is justified, on the one hand, by the recent trends in the financial services sector, revolving around digital change, drawn by the wider consumer and global mortgage markets into the UK residential mortgage industry (Bookallil & Birkby, 2017).

Some examples of such disruptive technologies from consumer markets, across industries, include drive sharing like Uber which disrupted traditional taxi services, WhatsApp or other chatting or voice-calling applications which have disrupted existing telecommunications companies, or Netflix which disrupted cable TV.

In terms of the global mortgage markets, examples of innovative technologies from across the Globe include the provision of fully digital solutions that can instantly verify the information provided in online mortgage applications and approve loans in as little as 8 minutes, in addition to offering robo-advice, or the use of data and analytical insights to target advertisement to consumers before, during, and after they get a mortgage, to name but a few (Bookallil & Birkby, 2017).

From this perspective, the question of the extent to which technological advancement a disruptive factor in the UK residential mortgage market becomes natural.

On the other hand, the research question is justified, particularly at this moment in time, by the fact that, as ten years have passed since the end of the global financial crisis in 2008-2009, the focus shifted from financial innovation, to regulation innovation, and now to technological innovation. In other words, the research question can be looked at not only from the perspective of the mortgage market in the context of the wider financial services market, or from the viewpoint of the UK, in comparison to other countries or the global level, but also from the perspective of the residential mortgage market in the UK experiencing a

significant and inevitable change due to technological advancement, before any new mortgage product is being invented, or a new regulation is implemented.

6.4 Research objectives

To help answer the research question above, and to provide clarity and guidance to this study (Bryman & Bell, 2015), this study puts forward the following objectives:

- Understand the role technology plays at the moment in the application process for residential mortgages in the UK.
- Investigate what emerging technological innovations would provide disruption by comparing the UK mortgages with other similar financial products in the UK, and worldwide.
- Evaluate the competitive advantage that technological disruption will give lenders and brokers.
- Assess the demand from consumers for technological disruption in the UK residential mortgage market.
- Propose a theoretical framework for adopting technology as a positive driver for change across the UK residential mortgage industry.

These particular objectives have been selected as they are vital for the research and data analysis that will help answer the research question, such as the need to understand the current state of technological innovation within the UK residential mortgage sector, as well as the need to analyse the potential opportunities of technological disruption in the UK mortgage sector, in relation to other financial products or other markets, for comparison and contrast.

The remaining three objectives help in answering the research question by drawing from the existing literature on competitive advantage (Porter, 1985), consumer behaviour (Debreu, 1959), and consumer demand theory (Johnson, 1958). In addition, the last objective not only helps to provide a complete answer to the research question, but it also aims at contributing to the existing body of knowledge with a proposed theoretical framework for the analysis of the need of technological disruption in driving the change of the residential mortgage market in the UK. This will be further explored in the next subsection of this research, focusing on the value added of the study.

6.5 Contribution of the research study

By answering the research question, the contribution of this study to the existing literature is twofold. On one hand, it helps to cover the gap in the literature on the need for disruptive technology in the UK residential mortgage market, and on the other hand, it contributes to the

business field by addressing and trying to understand the reasons behind the gap between the available technology in the wider financial services sector in the UK, and the technology being used in the residential mortgage market.

In addition, the added value of this research also consists of the fact that it provides professionals in the financial services and information technology sectors with a starting point which could help prompt them to identify potential innovation opportunities in the residential mortgage market. What is more, based on the findings from this research, the identified opportunities could also be tested for their economic feasibility.

Lastly, as briefly stated in the previous subsection, a major contribution of this study to the existing literature is that, by capturing both the perspective of brokers as well as the perspective of consumers of residential mortgages in the UK, this research study proposes a theoretical framework to help further the study on the adoption of technology innovation as a positive driver for change in the residential mortgage sector. This theoretical framework encourages research on the topic, as it can serve as a tool which can be tested empirically, but it can also be enriched with theoretical arguments, based on new research on the technology as a driver for disruptive change in the residential mortgage market.

6.6 Structure of the research study

This chapter of the study provides the context for this research study aimed at critically analysing the need for a disruptive change in technology as part of the UK residential mortgage market, before clearly setting out the aim, research question to answer and the research objectives to reach, and finally argues that this study contributes to the wider business and financial fields, both from a research perspective, as well as from the point of view of practitioners in the fields.

Following the introduction, the literature review chapter critically analyses the existing research and their findings on the topic of disruptive technology adoption in the residential mortgage market in the UK, borrowing from several fields such as business, finance, technology. Theoretical models such as Porter's theory of competitive advantage (Porter, 1985) and the dynamic capabilities framework (Teece et al., 1997) constitute the theoretical basis for the discussion.

The next chapter of the dissertation focuses on the research methodology which is built on a post-positivism epistemology which allows for a critical evaluation of the observed data (Trochim, 2006), and which uses a mixture of both qualitative and quantitative approaches. In this regard, two surveys, a qualitative survey which targets a small number of mortgage professionals, and a quantitative survey targeting 1000 mortgage consumers, will be utilised. This will help explore, and understand the data on technological advancement in the UK

residential mortgage market, before formulating informed hypotheses which will be tested through the quantitative analysis of data, before reaching conclusions.

Following the research methodology chapter, this research includes a data analysis chapter focused at analysing and presenting the findings from both the qualitative and the quantitative surveys. The key findings are then interpreted in the next chapter which critically analyses them in the context of the technology disruption in the UK residential mortgage market, together with their implications for practitioners in the field, as well as for researchers.

The ethical implications will also be thoroughly analysed, particularly because the research involves direct interaction with the participants to both surveys. As the ethics section highlights, all measures will be taken to ensure anonymity of the personal data of survey participants, as well as the avoidance of sensitive topics which may cause harm in any way, by following the University's ethics code (UWTSD, 2017).

7 Literature review

Following the previous chapter which provided the research background on the need for technological disruptions within the UK residential mortgage market, the critical literature review chapter explores the extant research in the fields of business, finance, and technology on the topic of disruptive technology applied to the residential mortgage market in the UK.

The theoretical framework for this study builds on Porter's theory of competitive advantage (Porter, 1985) and the dynamic capabilities model by Teece et al. (1997). The findings from empirical research conducted on this topic will also be explored in this chapter, to show the progress made and to highlight the existing gaps in research.

7.1 Conceptual framework

Originating in Schumpeter's concept of 'creative destruction' (Schumpeter, 1950), the terms 'disruptive technology' and 'disruptive innovation' were coined by Clayton Christensen in 1997 who believed that excessively relying on the already known or presumed needs of current customers could be detrimental for a company when a novel technology enters the market (Christensen, 1997). This conflict between old and new could lead to situations where complacent business players focus on serving 'old needs', while new players capture the majority of the market by serving new needs through the help of disruptive technologies.

Contributing to the popularisation of the disruptive technology framework, Tellis and Sood (2011) argue that disruption occurs when the performance of the new technology exceeds that of existing technology, while Danneels (2004) states that "a disruptive technology is a technology that changes the bases of competition by changing the performance metrics along which firms compete" (p. 248).

The theoretical literature on disruption differentiates between disruptive innovation and sustaining innovation. The former is initially perceived as inferior to the latter by existing customers who are reluctant to switch immediately to new products or services solely based on price attractiveness but who can do so if the quality of the new offering meets their needs. The latter consists of incremental breakthroughs that can help realise steady profits for incumbent businesses (Christensen et al., 2015).

Nevertheless, it is not always clear what constitutes disruptive technology, since any disruption or profound change in the market is by definition different than anything before it. To this point, Nagy et al. (2016) propose a technological perspective aimed at helping managers to determine if an innovation is disruptive or sustaining. The authors define disruptive innovations through the use of innovation adoption characteristics such as performance metrics or consumer expectations and argue that disruption is relative to the

market players and the consumers since an innovation can be disruptive to some and yet be sustaining to others.

Furthermore, disruptive technologies could have a negative effect on the market, especially for existing players who are resistant to change, but they could also have a positive effect for flexible players or new entrants both from a financial and market perspective (Venkatash & Davis, 2000).

Also, as Christensen et al. (2015) show, incumbent market players could, in effect, create the business opportunities for technology disruptors to enter the market since established businesses typically try to provide their most profitable and demanding customers with ever-improving products and services while paying less attention to less-demanding customers. This creates a niche market for new players who address the low-end customers with a 'good enough' product. However, to empirically test this argument, it is necessary to investigate whether the reason for this is because incumbents are focusing on their most profitable customers, and hence, not on innovation which would entail making use of a different set of resources, or the fact that not everything the incumbents describe as disruptive genuinely is so.

Before critically analysing the theoretical framework for this discussion, it is important to place the mortgage market within the services industry sector. Also, the residential mortgage market is dependent upon the demand on the housing market in the sense that house sales need to be positive to support engagement with the mortgage market (Christensen et al., 2015). As Venkatash and Davis (2000) found out, this translates into a significant reliance on the consumer to ensure the profitability of the residential mortgage market which means that the lender needs to meet the dynamic requirements of the customer to encourage customer demand and positive financial performance.

7.2 Theoretical literature

As the conceptual framework around disruptive technology points out, the theoretical foundation of this research study is based on notions of competition among producers of goods and services, in a market situation where consumers have increased knowledge about suppliers' offering (Kotler & Armstrong, 2010).

This theoretical background is based on Michael Porter's (1985) generic theory of competitive advantage which argues that organisations can achieve competitive advantage by focusing on cost leadership, product differentiation or by adopting a focus strategy. Porter divided the latter into cost focus which translates into a low-cost strategy and differentiation focus, in other words, exploring niche markets.

The reasons for using Porter's model in this study include its well-defined structure, feasibility, clarity, simplicity, generality as well as popularity and complementarity with the other approaches like the dynamic capabilities model and the theories of consumer behaviour and consumer demand, used for explaining the need for technology disruption in the UK residential mortgage market, as detailed below.

Porter's model has later been developed to incorporate notions of brand development, brand strengthening and management of consumer behaviour which formed the market strategy of a firm (Wang et al., 2015). Therefore, this research studies the topic of technological disruption from the perspective of a firm's competitive advantage, using Porter's (1985) competitive advantage model, as well as the author's earlier generic strategies model (Porter, 1980) which stresses the importance of firms focusing on one of the mentioned strategies to avoid wasting resources.

As mentioned previously, the theoretical foundation of this research also draws from the dynamic capabilities model by Teece et al. (1997). Based on this framework, dynamic capabilities reflect the way firms make use of key resources and assets. Porter's idea of competitive advantage is integrated into this model since the capability of firms to develop specific and highly efficient processes which describe how they use the available assets generates specific sources of competitive advantage.

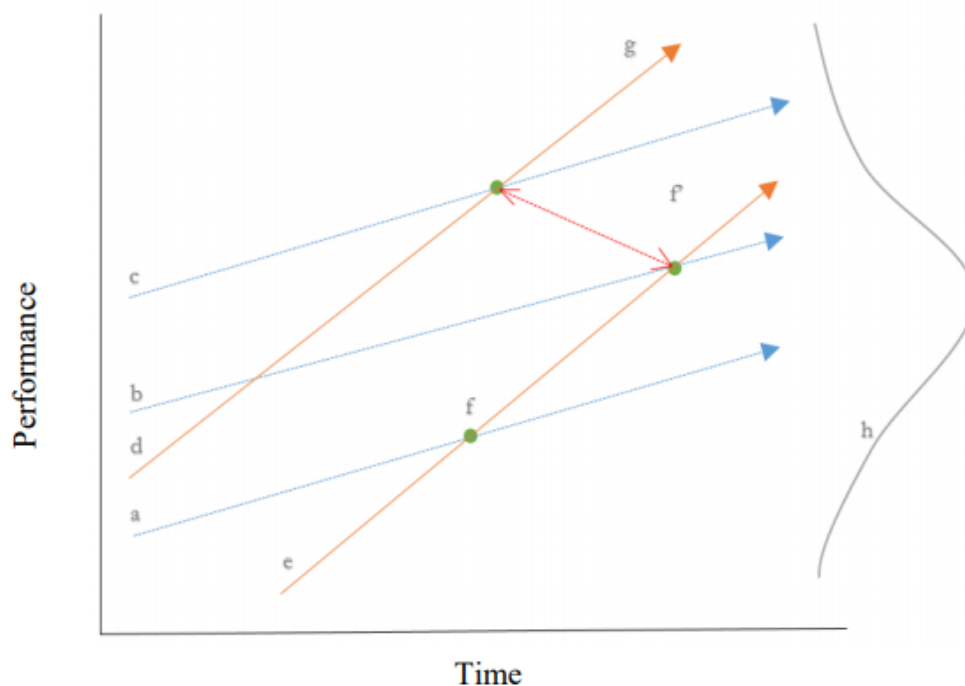
The dynamic capabilities model is key to explaining the phenomena of disruptive technology since the concept of dynamic capability represents "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece et al., 1997, p. 516) which is essentially a precursor for disruptive technologies and innovation. However, the way Leonard-Barton (1992) interprets the model by Teece et al. (2005), dynamic capabilities are confined to the limits of the existing market positioning, in addition to other path dependencies, whereas disruptive technology is usually seen in the literature as a means of breaking barriers, and change the market landscape (Kostoff et al., 2004).

Later, Teece (2018) explained the dynamic capabilities model from a different perspective by arguing that business models, dynamic capabilities, and strategy are interconnected and dependent upon each other. For instance, a firm's business model impacts the organisation design and thus the firm's dynamic capabilities, as well as the feasibility of specific strategies. Moreover, the author highlights the need to empirically test the dynamic capabilities model to better understand the practical aspects around business innovation, implementation and change.

Combining the concept of disruption with that of firm strategy in a dynamic environment, Christensen (1997) argues that disruptive innovations must be seen as a process, not as a

product or a service at a certain point in time. As seen in Figure 2 below, a disruptive innovation can follow a product performance trajectory (d and e), whereby products improve over time, or a customer demand trajectory (a, b, and c) which reflects the customers' willingness to pay for the performance. However, over time, disruptive innovation improves firm performance which meets the market demand (f and f'), thus satisfying the low market and the main market. Meanwhile, the sustained innovations meet the high-level needs (g) of the most profitable customers, working on the assumption that the performance levels are distributed between low-end and high-end customers (h).

Figure 2. Disruptive Innovation Process



-
- a) Performance demanded by low-level markets
 - b) Performance demanded by the established or traditional market
 - c) Performance demanded by high-level markets
 - d) Performance trajectory of sustained innovations
 - e) Performance trajectory of disruptive innovation
 - f) Point of invasion in low-level markets. f'. Point of invasion in established markets
 - g) Over-performance of existing innovations
 - h) Normal distribution of customers by performance demanded

Source: Sanchez et al. (2017)

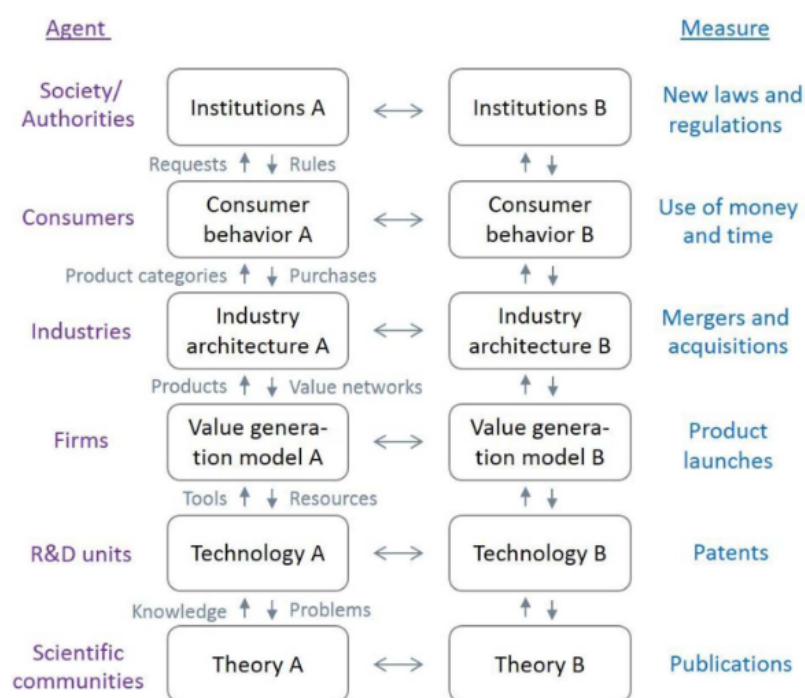
Regarding the theoretical research on disruptive technologies, Kostoff et al. (2004) have created a roadmap of a literary-based process, from the discovery to the development and

the implementation of disruptive technology. The authors start from the assumption that disruptive technology can generate growth, or it can even create new industries by introducing new products into the market. Also, Kostoff et al. (2004) believe that disruptive technology not only changes the interaction between firm and customer, or between supplier and consumer, but also that it has the power to alter workforce participation to the disrupted industries or the newly created ones by allowing workers with a standard training to gain new skills by learning the new processes and thus become competitive in the industrial workforce.

The literary-based disruption roadmap consists of exploring all possible paths of identifying a disruptive technology based on research by involving experts either in one or in both the implementation or consultancy phase of the discovery process. According to Kostoff et al. (2004), by adopting a literary-based disruptive roadmap, combined with a practical workshop, firms would increase their likelihood of success.

A valuable recent attempt to build a theoretical disruption framework belongs to Kilkki et al. (2018) who focus on the firm and industry levels. The model is layered from basic science to society and allows for a systematic analysis of different types of disruption including cheaper products, superior quality and disruptions from different industries. Plus, the model by Kilkki et al. (2018) helps to analyse the spread of innovations on a vertical basis between layers including scientific communities, R&D units, firms, industries, consumers, and society or authorities, and horizontally, between industries. A diagram of the framework by Kilkki et al. (2018) is illustrated in Figure 3 below.

Figure 3. A layered technology disruption framework



Source: Kilkki et al. (2018)

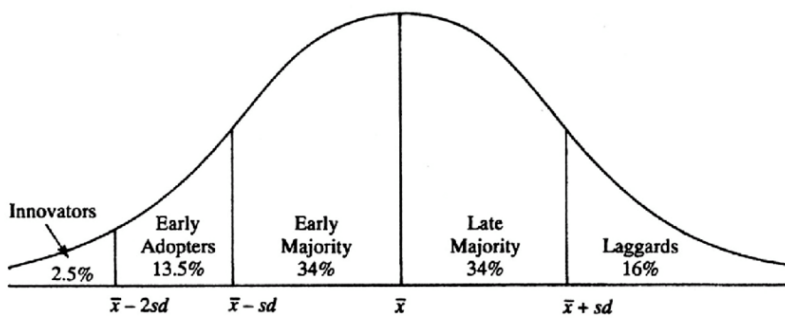
So far, the literature review has looked at theories that focus on the firm within a certain market setting and only mentioned consumer needs, expectations or preferences tangentially, in relation to the offering of firms. However, the theoretical framework for this study would not be complete without the consumer perspective, as the primary beneficiary of disruptive technologies. Therefore, the theories of consumer behaviour by Debreu (1959) and the consumer demand theory by Johnson (1958) are worth examining to gain a better understanding of the impact that technology disruption has on consumers.

Debreu (1959) formulated a consumer behaviour theory in deterministic situations which outlines the conditions that markets need to operate under to ensure optimal resource allocation. Also, as a neo-classic economist, Debreu (1959) argues that individuals are rational agents who maximise their utility functions for assessing their options.

Another precursor of the consumer theory is Johnson (1958) who focused on the demand generated by consumers based on their preferences. Johnson (1958) argued that all intrinsic properties of particular goods which differentiate goods from each other are what makes consumers prefer one item over another, while the tastes of consumers are ignored under the assumption that consumers are rational, hence any eccentric taste they might have must be considered rational.

The theory of consumer behaviour has greatly evolved with most recent theories adopting the hypothesis of bounded rationality (Simon, 1979; Conslick, 1996) which seems to better explain the decision-making process of economic agents in comparison with the neo-classic theories based on complete information, full rationality and lack of risk perception. As the consumer behaviour theory is vast with numerous ramifications in various fields, this research only briefly touches upon it to help better understand the depth of the disruptive technology concept.

Consumer behaviour can be categorised using the diffusion of innovation theory. Rogers (2003) states that “many innovations require a lengthy period of many years from the time when they become available to the time when they are widely adopted. Therefore, a common problem for many individuals and organizations is how to speed up the rate of diffusion of an innovation.” He breaks this down into 5 stages, illustrated in Figure 4 below.

Figure 4. Everett Rogers' adopter categories, based on diffusion of innovation

The innovativeness dimension, as measured by the time at which an individual adopts an innovation or innovations, is continuous. The innovativeness variable is partitioned into five adopter categories by laying off standard deviations (sd) from the average time of adoption ($\bar{x}$).

Source: Rogers (2003)

In order for an innovation to become prevalent, different groups of people will need to adopt it. Rogers (2003) has categorised people dependent on the stage they adopt innovation, and found common characteristics for each category. These are summarised in Table 1 below.

Table 1. Adopter categories and their characteristics

Adopter category	Characteristics
Innovator	Willing to take risks, have financial liquidity, are social and have closest contact to scientific sources and interaction with other innovators. Their risk tolerance allows them to adopt technologies that may ultimately fail. Financial resources help absorb these failures.
Early adopters	Highest degree of opinion leadership among the adopter categories. Higher social status, financial liquidity, advanced education and are more socially forward than late adopters. They use judicious choice of adoption to help them maintain a central communication position.
Early majority	They adopt an innovation after a varying degree of time that is significantly longer than the innovators and early adopters. They have above average social status, contact with early adopters and seldom hold positions of opinion leadership in a system.
Late majority	They adopt an innovation after the average participant. These individuals approach an innovation with a high degree of skepticism and after the majority of society has adopted the innovation. Typically skeptical about an innovation, have below average social status, little financial liquidity, in contact with others in late majority and early majority and little opinion leadership.
Laggards	They are the last to adopt an innovation. They show little to no opinion leadership. These individuals typically have an aversion to change-agents. Typically tend to be focused on "traditions", lowest social status, lowest financial liquidity, oldest among adopters, and in contact with only family and close friends.

Source: Rogers (2003).

7.3 Empirical research on technology disruption

The empirical literature which explores the concept of technology disruption is rather vast, although fragmented, since it has been examined by scholars and practitioners in the fields of business, finance and technology and applied in different types of organisations which led to different findings. A critical review of the most relevant findings on the technology disruption topic, especially in the context of the residential mortgage market, will help contour the extant literature in the field, highlight the research gaps and provide the relevant background for this research.

From a business perspective, Krämer et al. (2016) have analysed the impact of technology disruption on the customer relationship, and ultimately, on corporate strategy. In their study, the authors incorporate recent changes within the business environment whereby technology disruptors are also preoccupied with their relationship with customers and are willing to make extra efforts to ensure a high customer benefit, especially for those customers with high-profit margin and sales potential. The corporate strategy is subject to two-way information flow, on one hand from customers to the company, through digitised processes which ensure real-time data transfer about products and services, and on the other hand from the company to the customers, through direct marketing which is facilitated in a digital and networked environment.

This relationship between companies capable of generating technology disruptions and their customers represents both an opportunity and a challenge from a business strategy perspective since, in a market dominated by big data, the ability to extract valuable information from the abundance of data available and to use it strategically becomes a source of competitive advantage for both technology disruptors and for sustaining market players.

Also, Kilkki et al. (2018) have tested their theoretical model of layered disruption on specific business cases such as the GSM, the GPS, and the digitalisation of photography. The authors identified the key milestones in the development of these disruptive technologies and correlated them with key changes in the purchasing decision of consumers. Moreover, by applying the disruption framework to the business case of the 3D printing, Kilkki et al. (2018) argue that given the fact that metrics such as articles, patents, books, sales and the stock price of 3D Systems accelerated at an unprecedented pace between 2010 and 2014, after a rather long and quiet period, this technology can be judged as being disruptive. These technologies and their disruptive character are analysed in the context of the telecommunication industry, specifically within the mobile phone sector, when it comes to the GSM, GPS and the digitalisation of the photography, and the information and communications sector, when it comes to 3D printing.

Within the field of financial research, a new approach has been experimented with recently, called regulatory sandbox, whereby regulators and firms or third-party providers of financial services can collaborate on new technologies in a controlled environment. One such example is the UK FCA and the Dutch Authority for the Financial Markets (AFM)/Dutch National Bank (DNB) collaboration which works as a regulatory sandbox (AFME & PwC, 2018).

However, the UK financial market holds a paradox between the rapid technological advancement in some areas like electronic or online banking (Chou & Chou, 2000), while the residential mortgage sector in the UK has seen a slowdown, at least since the 2008-2009 global financial crisis due to its roots in the retail industry.

Regarding the residential mortgage market, which is the focus of this research, technologies such as artificial intelligence (AI), robot-advice, digital intermediaries, open banking and blockchain are a few examples of opportunities as well as threats for lenders (IRESS, 2018). The Intermediary Mortgage Survey Report 2018, based on 417 brokers in the UK residential mortgage market, shows that 6% of intermediaries would implement a robot-advice offering in the next 12 months, while 14% of them possibly would do so. Furthermore, 14% of intermediaries surveyed saw robot-advice technology as a business opportunity and developments in financial AI as aiding consistency and efficiency to the fact-finding and product search processes (IRESS, 2018).

As it can be seen, mortgage market players seem more inclined than ever to invest in technology that would help them increase their market share. According to Sorohan (2019), John Cabell, a Director of Financial Services at J.D. Power argues that the right balance to strike is between a digital mortgage experience and the human interaction customers still want. He also mentions five essential values that lenders in the mortgage market need to incorporate in any customer experience such as convenience, recognition, advice, trust and value. Therefore, as a professional in the mortgage market, Cabell thinks that disruptive technology is not sufficient to make a firm competitive in this sector unless it can deliver on all of the above values, as he points out that customers no longer compare a mortgage company with another but with companies like Amazon and Google.

Drawing from the experience in other countries regarding the need for disruptive technologies within the residential mortgage markets, Hirsch-Kreinsen (2011) analyses the transformation process of the German innovation system, regarding the financial market. Also, Veuger (2018) explores blockchain for the real estate sector in the Netherlands and addresses the question whether blockchain is only a technological disruption, or is it here to stay, by changing the entire value chain of the real estate market. By interviewing some key practitioners in the real estate field, Veuger (2018) concludes that blockchain has not yet proven its practical value for the real estate sector. However, the fact that the real estate sector developed to the point where it adopted blockchain technology is a symptom of

changing values from both the owners of real estate and the managing firms. In line with the theory of dynamic capabilities by Teece et al. (1997), Veuger (2018) agrees that the real estate sector must be able to show that it can absorb and consolidate the blockchain innovation before it can be classed as a disruptive technology.

In terms of the global mortgage markets, examples of innovative technologies from across the Globe include the provision of fully digital solutions that can instantly verify the information provided in online mortgage applications and approve loans in as little as 8 minutes, in addition to offering robot-advice, or the use of data and analytical insights to target advertisement to consumers before, during, and after they get a mortgage, to name but a few (Bookallil & Birkby, 2017).

To conclude the literature review chapter, the concept of disruptive technology, which stems from Schumpeter's concept of 'creative destruction' (Schumpeter, 1950), was coined by Christensen (1997) who saw it as a business strategy by new players entering the market to capture clientele by serving new needs through the help of disruptive technologies.

Furthermore, the theoretical foundation of this study on technology disruptions is based on Porter's (1985) competitive advantage theory who identifies cost leadership, product differentiation and focus strategy – either cost or differentiation focus – as main business strategies capable of generating a competitive advantage for a firm. The theoretical framework for this study also employs the dynamic capabilities model by Teece et al. (1997) which explains the phenomena of disruptive technology through the notion of a firm's ability to absorb and adapt to internal and external competencies in a rapidly changing environment. Christensen (1997) also argues that disruptive innovations must be seen as a process, not as a product or a service at a certain point in time. Later, Teece (2018) revised the model as an interdependency among business models, dynamic capabilities and strategy. The theoretical basis of the research is completed with the theories of consumer behaviour (Debreu, 1959; Johnson, 1958) which were later developed into models of bounded rationality (Simon, 1979; Conslick, 1996) which better explain the current decision-making process of consumers.

Also, the analysis of the empirical literature shows the availability of extensive research in the fields of business, finance and technology on technology disruption, yet with relatively different outcomes and implications for each field. Krämer et al. (2016) have analysed the impact of technology disruption on the customer relationship, and ultimately, on corporate strategy. Plus, Kilkki et al. (2018) have applied their model of layered disruption on the cases of GSM, GPS, and the digitalisation of photography, showing that major changes in the development of these disruptive technologies are associated with changes in the purchasing decision of consumers.

Within the financial field, disruptive technologies in the mortgage market such as digital checks of the applicants' data, customer robot-advice and targeted digital marketing are some examples. However, there is still a significant gap between these innovations and the current technological advancement in other industries or other financial markets, which is one of the reasons for conducting this research.

The next chapter presents the methodology of this study by outlining the epistemological framework, together with the presentation of the research method consisting of a mixed method of a qualitative and quantitative research survey, the data sample, and closing with the ethical implications of conducting this research.

8 Methodology

After a critical review of the theoretical and empirical literature on the topic of disruptive technology has been conducted, with a focus on the UK residential mortgage market, this chapter explains the methodology of research for this study. The first section outlines the suitable epistemological framework for this study which is post-positivism, followed by the presentation and justification of the mixed-method research approach which uses the survey to obtain data on the UK mortgage market. This is then followed by the data sampling section and by an outline of the ethical implications of this study.

8.1 Epistemology of the research

Given that this study aims at providing an objective analysis of technology disruption within the UK mortgage market, the positivist paradigm would seem suitable (Easterby-Smith et al., 2012) since positivism is considered objective and independent from human consciousness (Crotty, 1998). Moreover, the research paradigm of positivism is based upon the idea that concepts and knowledge are generated based on experiment and observation (Ryan, 2006).

Nevertheless, positivism also has its limitations in the sense that it can be inflexible and ineffective in helping to understand the process of generating new theories, according to Easterby-Smith et al. (2012). Also, positivism assumes that if it is done based on scientific methods, it can predict social trends and can be used to control events. This was shown through the empirical literature review which showed that it is not always the case when it comes to technology disruption such as the blockchain technology in the Netherlands which did not provide conclusive results according to Veuger (2018).

Therefore, a more suitable paradigm for this research is post-positivism since it allows the use of several measures and observations for generating data and effectively analyse it. This, in turn, helps produce a more nuanced understanding of reality (Trochim, 2006). As O'Byrne (2007) argues, post-positivism is a critical approach to classical positivism.

Furthermore, given the underlying uncertainty of the mortgage market, the lens of post-positivism is more appropriate for the evaluation of technology disruption in this context using given that it assumes that the research findings are valid within a certain realm of probability (Mertens, 2009). Plus, post-positivist research is broad rather than specialised on a particular field which is the case for this interdisciplinary study, and it best combines theory and practice since technology disruption draws from existing theories and it informs new ones (Ryan, 2006).

8.2 Research method

As mentioned above, a mixed-method approach, combining both qualitative and quantitative research methods, has been adopted to study the need for technology disruption within the UK mortgage market. Initially, qualitative research was conducted based on an open-ended questionnaire conducted with participants who work as mortgage professionals and can provide a perspective of the residential mortgage market in the UK from within the sector.

The qualitative research method has the advantage that it can help develop a complete, clear and articulate description and understanding of a phenomenon such as technology disruption (Kelle, 2006). Plus, the open-ended questionnaire offers the possibility to verify previous facts or answers; it helps reveal emotions, opinions, and it indicates procedures for information collection and institutional improvement (Kintzer, 1977).

However, there are also disadvantages to the qualitative research approach such as the fact that qualitative research allows for smaller sample sizes than quantitative research does, and it is time-consuming (Rahman, 2017). The sample size disadvantage has been eliminated in this dissertation by also using the quantitative research method which has been conducted using a large enough sample size, while the time-consuming disadvantage has been limited by reducing the number of open-ended questions to four. Henceforth, the respondents were not discouraged by the open-ended nature of the questions given that they only had to answer 4 questions, however, they were free to elaborate on each question.

According to Leung (2001) who provides a normative approach towards building questionnaires for social sciences, the questions for this dissertation's open-ended questionnaire have been formulated to maximise the response rate, meaning the proportion of subjects answering the questionnaire versus subjects that do not answer and to obtain accurate relevant information for the survey. The response rate for the qualitative open-ended questionnaire has been 38 per cent.

In addition to the qualitative research method, a quantitative research survey was used to obtain information around the need for technology disruption from consumers of mortgage products in the UK.

The quantitative research method has the advantage that it uses a large enough sample size which allows the researcher to conduct frequency analysis and regression analysis and obtain statistically relevant results (Rahman, 2017). Plus, quantitative research methods are generally not very time consuming, especially not the stage of conducting the survey online and gathering the responses. The analysis stage can become time-consuming, depending on the complexity of the correlations and relationships sought by the researcher.

Nevertheless, quantitative research methods have disadvantages too, including the fact that they usually provide a snapshot of a phenomenon and not an in-depth view of the respondents' rapport with the subject studied (Rahman, 2017).

Plus, combining both qualitative and quantitative research methods has several purposes and advantages. As Kelle (2006) argues, the mixed-method approach within the social science field not only compensates for the limitations and weaknesses of the two methods but it also serves as the mutual validation of the data and findings and it helps paint a complete picture of the domain under investigation than the mono-method approach can provide.

In terms of conducting survey questionnaires online, Wright (2017) highlights that there are several advantages to this approach, including the limited financial costs, the easy access to a variety of populations among potential respondents, the time-saving component as mentioned above. However, survey questionnaires conducted online, as Wright (2017) highlights can also have disadvantages such as the limited amount of information available about the sampled populations, especially because of the data protection regulation which applies to most websites.

8.3 Qualitative open-ended questionnaire analysis

The responses to the open-ended questionnaire have been analysed by identifying recurrent themes to the questions, especially questions 4, 5, 6 and 7 which require the respondent to elaborate based on their experience.

The analysis of the 19 response sets to the four open-ended questions has been conducted manually by highlighting the main ideas of each set of responses and generating a list of all the topics and ideas raised. This list of codes was then synthesized down into a series of categories or themes. Each response could fall into multiple themes. This method was preferred in this specific case to the available software for qualitative data analysis, such as ATLAS, Dedoose, MAXQDA or NVivo, mainly due to the limited number of responses as well as to the different approaches adopted by respondents to answer the same questions.

The reliability of the qualitative analysis has been ensured by relating the findings obtained to the category of professionals responding (e.g. mortgage advisors based in the UK who have the CeMAP qualification). The response sets have been cross-checked and tested against the themes, patterns initially identified (Labuschagne, 2003). Plus, the researcher made sure not to generalise the results obtained to the entire mortgage industry in the UK or abroad.

As Labuschagne (2003) points out, the qualitative analysis of the open-ended questionnaire requires focusing on the meaning of the phenomena identified and on the lived experiences,

which may not be readily observable. Plus, the social context in which the events occur is key to the meaning attributed to the experiences lived.

8.4 Quantitative regression analysis

The analysis of the results from the quantitative survey has been done using the Microsoft Office Excel package and SPSS.

The regression analysis based on the data obtained from the quantitative survey has been conducted by estimating an ordinal logistic regression model, using multiple determinant or independent variables and one determined or dependent variable. Because the determined or dependent variable describes the ease of applying for a mortgage and the categories can be ordered from very easy to very complex, in the sense that there is a hierarchy within the categories of responses, the determined variable is an ordinal scale variable (Gujarati, 2009). Therefore, the regression model is also an ordinal logistic model. However, some of the independent variables included in the model are nominal scale variables (Gujarati, 2009) as they simply denote categories without a ranking among the categories. For example, the gender variable and the channel variable do not present any superiority of one category of response over another.

The choice of variables, the variable types and the justification of this choice have been presented in Table 2 below.

Table 2. Variables selected for the linear regression analysis

Variable name	Variable type	Description	Justification
Ease of applying	Ordinal	Ease of applying for a residential mortgage: 1-very complex; 2-complex; 3-normal; 4-easy; 5-very easy	This dependent variable shows the sentiment of the respondents to the survey towards the ease of applying for a residential mortgage.
Gender	Nominal	Gender of respondent: Male=0; Female=1.	As Dietrich (2005) finds, mortgage lenders such as banks discriminate on the basis of gender. Therefore, it is interesting to find out whether men perceive the ease of applying for a mortgage differently than women do.
Age	Ordinal	Age of respondent: 18-24=0; 25-34=1; 35-44=2; 45-54=3; 55-64=4; 65+=5.	Age is another discrimination factor for mortgage application success, according to Dietrich (2005). Plus, given that technology disruption is the focus of this paper, it is interesting to see whether different age groups perceive the need for new technology differently.
Channel	Nominal	Channel of sending mortgage documents: By hand/paper=0; E-mail=1; App=2; Website=3.	The channel of sending documents for a mortgage application, either in paper format or by hand, through e-mail, through a mobile phone application, on a website such as a mortgage lender portal, or through a broker.
Ease versus personal loan	Ordinal	Ease of applying for a residential mortgage versus ease of applying for a personal loan or insurance: 1-easier with a mortgage; 2- similar; 3- harder than with a loan	Respondents have been asked to compare the application for a residential mortgage with that for a personal loan or insurance in terms of complexity of the process. This variable provides a reference point when assessing the ease of applying for a residential mortgage by comparing the experience, from the perspective of the consumer, with a similar experience, namely that of applying for a personal loan or insurance.

Source: Author

The ordinal logistic regression model which uses the variables described in Table 1 above can be written as per this equation:

$$Ease_of_applying = \alpha_0 + \alpha_1 Gender + \alpha_2 Age + \alpha_3 Channel + \alpha_4 Ease_versus_personal_loan$$

This ordinal logistic regression model has been estimated using the weighted least squares (WLS) method since the assumptions of the ordinary least squares (OLS) regressions are violated when this method is used with a non-interval outcome variable (Gujarati, 2009).

8.5 Data sample

The sample selected for the qualitative research method has been obtained from the professional networking platform LinkedIn, focusing on UK-based citizens who have a LinkedIn profile that displays the mortgage industry as the main field where they activate and who are involved in the application or the sales process of mortgages. Therefore, a filter in terms of job titles has been applied for people who work as Mortgage Brokers, Mortgage Advisors or Mortgage consultants. An additional criterion is that the people selected as part of the data sample have the Certificate in Mortgage Advice and Practice (CeMAP) qualification listed on their LinkedIn profile (see Appendix 1 for an example search). This qualification meets the FCA examination standards for providing advice on mortgage products and is valid in the UK (The London Institute of Banking & Finance, n.d.).

Once the suitable population has been identified, an invitation has been sent to the first 50 potential respondents who met the criteria listed above, using a sample message where the name of the invitee was changed in each message. The sample message which also included the link to the online open-ended questionnaire can be found for reference in Appendix 1. The seven questions included in the online questionnaire can be found in Appendix 1.

Using this approach, 50 different individuals have been invited to respond to the open-ended questionnaire. Based on the responses received, a sample of 19 responses to all seven questions has been compiled, after eliminating incomplete sets of responses. The responses have then been proofread and anonymised for ethical reasons, as explained below. A snapshot of one random response including answers to all four questions has been included in Appendix 1.

Regarding the quantitative survey, the data were sampled based on a Google Survey including four questions, as included in Appendix 2. Google Surveys (formerly known as Google Consumer Surveys) is a service that allows researchers to survey Google users inexpensively and quickly. Users matching broad demographic criteria are shown the survey

instead of an advert. An example of a Google Survey being displayed on the web is shown in Appendix 2.

The criteria selected were:

- User based in the UK
- Speaks English

The first question presented is a filter question, to further refine respondents. The question was “Have you taken out a mortgage or remortgage in the last 2 years?”. This is shown in Appendix 2. Users that responded “No” or “Maybe” did not receive any additional questions. Only users that responded “Yes” were able to proceed to the additional questions. In total 1000 people qualified and completed the survey. This is the pre-agreed number of responses requested, the Google Surveys system stopped serving the survey to users once it had been fully completed 1000 times.

The data has then been cleansed in terms of formatting and editing of responses so it can be filtered in Excel (i.e. all majuscule or all minuscule, proofreading, etc.), plus any obscene or incomplete responses have been eliminated. Any names or personal information other than demographic information has been eliminated to ethical reasons and a randomly generated user ID has been assigned to each response. A snapshot of the first 25 response lines has been included for reference in Appendix 2.

8.6 Ethical implications

The ethical implications of using a mixed-method approach combining the qualitative open-ended questionnaire and the quantitative survey questionnaire have been taken into consideration. All efforts have been made to ensure anonymity and personal data protection for both the survey questionnaire and the open-ended questionnaire, as well as to avoid sensitive topics which may harm the participants in any way. Thus, the University’s ethics code has been followed thoroughly.

As briefly mentioned above, the names of the respondents have been eliminated from the open-ended questionnaire, while any other personal data like address, email or telephone number have not been gathered from respondents. Regarding the quantitative survey, the responses have been anonymised by eliminating any names, email addresses, physical addresses or telephone numbers. A random user ID has been generated for each response line in order to create a unique entry.

Plus, no personal data, for both the qualitative open-ended questionnaire and the quantitative survey, have been stored by the researcher, nor have been included in this dissertation or any other publication. Furthermore, to protect participants to the online questionnaires in a

similar way with participants to paper-based questionnaires conducted face-to-face, participants were required to read and sign a statement that describes the research and explains their rights, as well as the option to refuse to answer any question that they consider harmful. However, as Hamilton (1999) rightly notices, when conducting online research, even if the researcher includes an informed-consent statement page and a debriefing page, participants cannot be forced to read it. Therefore, an ethical aspect which remains with online research is that researchers have little control over the participants' experience with online questionnaires (Hamilton, 1999).

9 Data analysis

9.1 Qualitative mortgage professionals survey data analysis

9.1.1 Demographic question analysis

Although the most valuable insights from the open-ended questionnaire can be obtained by qualitatively analysing and interpreting the responses, it is worth spending some time to provide a quantitative analysis around the profile of respondents, in order to have some context to the findings.

The qualitative survey was sent out to 50 relevant mortgage professionals on LinkedIn, with 19 responses received.

The responses to the first question (“*What’s your job title?*”) have been condensed into two categories “*Mortgage Advisor*” and “*Director*”. *Mortgage Advisors* are anyone identifying as a front-line job role advising consumers about mortgages. The three respondents categorised as *Directors* self-identified as being a company director for an independent broker firm, this is summarised in Table 3 below.

Table 3. Summary of responses to qualitative survey by job title.

Job Title	Number of responses	Mean years of experience	Median years of experience
Mortgage Advisor	16	6.4	5.5
Director	3	13.3	14

Source: Author's calculations

The majority of responses (84%) were mortgage advisors. However, the directors that responded had a mean experience of more than double (2.07 times) that of the mortgage advisors.

After merging similar terms, the responses to the second question (*What sort of firm do you work for?*) have been condensed into four categories. Shown in Table 4 below.

Table 4. Summary of responses to qualitative survey by type of firm.

Type of Firm	Number of responses	Mean years of experience	Median years of experience
Self-employed	4	7.5	7.5
Bank / building society	5	3.4	3
Independent mortgage broker	9	10	11
Estate Agent	1	5	5

Source: Author's calculations

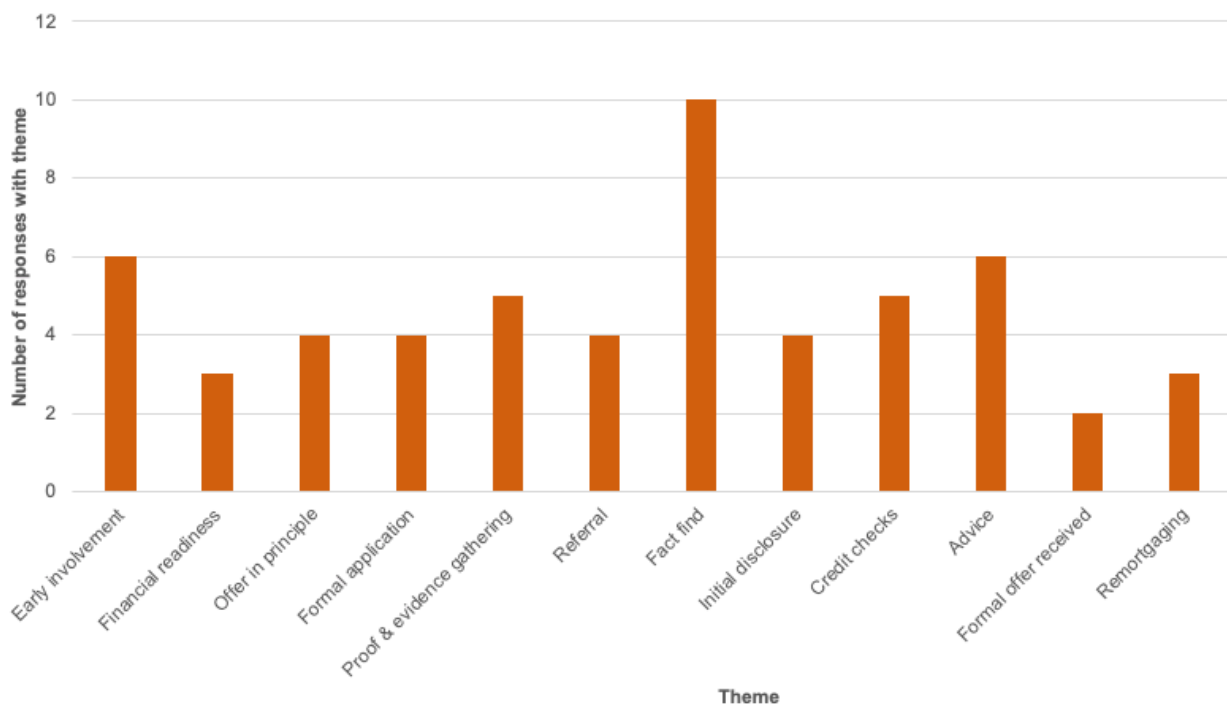
The most experienced mortgage professionals worked at independent mortgage advisors, with a mean of 10 years industry experience. The least experienced were those working at banks or building societies, with a mean of 3.4 years.

The higher the level of industry experience, the more attuned to the issues within the industry they would be expected to be. Overall the experience level of industry experience was high, with a mean of 7.4 years across all responses.

9.1.2 Mortgage application process

Question 4 of the qualitative survey asked “*Can you explain the process people normally go through to take out a mortgage?*”. The coding for this question was synthesized into 12 themes. In total 56 instances of these 12 themes appeared across the 19 responses, illustrated below in Figure 5.

Figure 5. Number of responses with themes for question 4 of the qualitative survey.



Source: Author's calculations

Many of the responses were similar, in that the FCA requires certain tasks are completed in a certain order for all mortgage transactions. Respondent 7 summarised the FCA requirements:

Initial disclosure (what we can legally advise on, how we're paid)

Fact find (all their details about their financial priorities and situation)

Advice (which mortgage product we recommend they choose and why)

Application (to a particular lender)

This formal process, meant that the majority of responses followed somewhat similar paths. However, some of the respondents also commented on more in informal stages in the process. For example a third (6 out of 19) of respondents identified that they were first contacted by customers far in advance of a formal mortgage application, in some cases years before hand. Multiple respondents identified that first time buyers were particularly susceptible to seeking advice early, in order to ensure they had financial readiness for obtaining a mortgage.

Respondents were clear that an offer in principle (also called an acceptance in principle) was easier to obtain from a lender than the formal offer, and this offer in principle was the normal basis for a consumer to then make an offer on a house, however, it has no legal guarantee to receive a formal offer.

Whilst multiple responses (4) mentioned that they received new customers through referrals or because they were already customers, Respondent 10 explained:

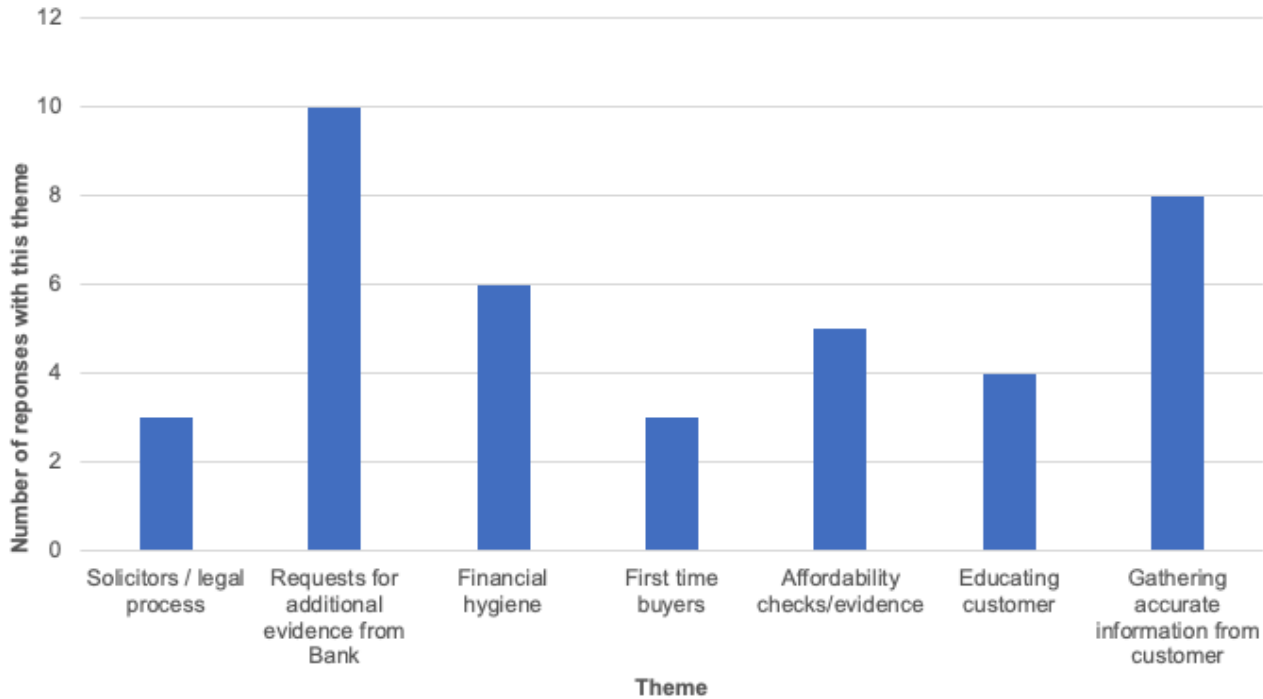
Once you have around 150 regular customers, you just contact them a few months before their current fixed rate mortgage ends [...] If you're remortgaging with the same bank the process is very straight forward as you don't need to submit fresh evidence documents.

This idea that remortgage customer transactions were easier was a recurrent theme.

9.1.3 Biggest delays in the mortgage application process

Question 5 of the qualitative survey asked “*What are the biggest delays and hurdles in the process?*”. The coding for this question was synthesized into 7 themes. In total 39 instances of these 7 themes appeared across the 19 responses, illustrated below in Figure 6.

Figure 6. Number of responses with themes for question 5 of the qualitative survey.



Source: Author's calculations

The most common theme, which featured in over half of responses, was lenders requesting additional evidence, Respondent 5 was one example of this, saying:

“The back and forwards with a bank when we’re trying to get a formal offer is the really painful bit. Even when you submit everything they normally ask for, they’ll come back and ask for more.”

Respondents didn’t complain so much about the *process* of sending lenders the additional evidence, but instead the concern was the *volume* of follow-up requests for more data. One of the most common areas that lenders request more evidence is on spending. An example is, Respondent 7:

“[the lender] want explanations (and proof) for everything they see on a bank statement”

Multiple respondents tied the heavy demands for evidence from lenders with the tighter FCA affordability rules. Affordability checks were referenced by 5 of the responses. Rather than

the affordability requirements causing people to be unable to borrow, our respondents identified that the main repercussion was the need for customers to conduct “financial hygiene”, for example Respondent 9:

“Affordability rules mean that people need to really clean up their lives before we can process a mortgage application. They need to really reduce their spending, cancel anything unnecessary. We often also need them to sort out any smaller debts – pay off credit cards etc”

The second most recurrent theme was the difficulty in gathering accurate information from customers, with it appearing in 8 of the responses. Some of the difficulties are systematic, for example Respondent 15 identified the difficulty in getting lenders to recognise informal side-income and the need for traditional bank statements which people don't always receive anymore. However, multiple respondents identified the customer as being a hinderance to the process of collecting data. Many of the respondents identified that customers weren't aware of how stringent the lenders checks would be, and the need for them to be completely transparent. Respondent 18 bluntly stated:

“Consumers lie (overstating income, understating debts and outgoings)”

This tied into another theme, which was the need for mortgage advisors to educate the customer on the mortgage application process. Not only do they need to provide advice on how to make their finances more appealing to a lender, but also correcting misinformation the customer may have. In particular 3 responses specifically reference first time buyers as being in need of help with the process. Respondent 19 identified that it was *“not unusual for first time buyers to come to you years before they end up buying”*.

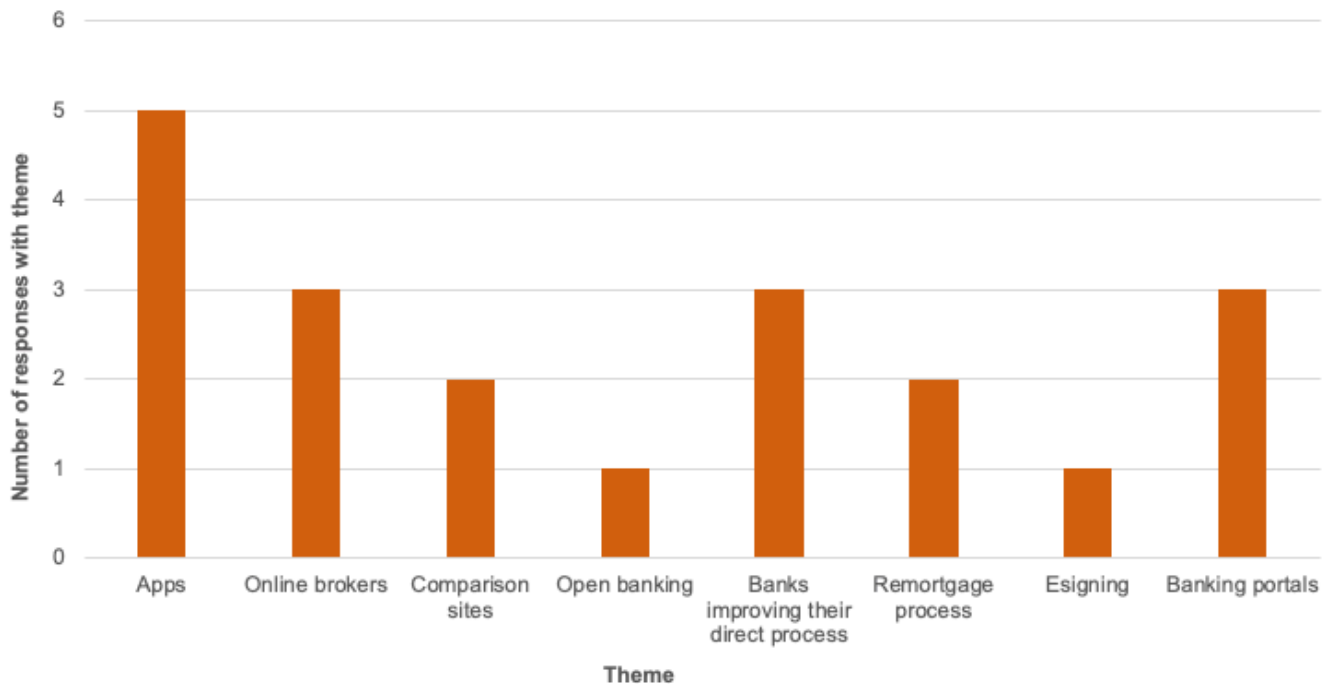
The overall picture of the hurdles in the process, form a flow:

1. Customers (particularly first time buyers) are unclear on the application process.
2. They often need to rearrange their finances to be able to best meet affordability requirements.
3. These affordability requirements mean the lenders are very diligent their checks, causing frequent requests for follow-up evidence and documentation.
4. Getting the required evidence, in the right format, from customers is not straightforward.

9.1.4 Emerging technology & improvement to the process

Question 6 of the qualitative survey asked “*What emerging technology are you aware of?*”. The coding for this question was synthesized into 8 themes. In total 20 instances of these 8 themes appeared across the 19 responses, illustrated below in Figure 7.

Figure 7. Number of responses with themes for question 6 of the qualitative survey.



Source: Author's calculations

The most frequent theme was specialised apps (5 responses). Some respondents saw advances in banking apps helping to improve the banks' own direct application process (3 responses).

Others were more aware of apps from online brokers offering more-automated mortgage advice (3 responses). Multiple respondents referenced the Habito and Trussle apps, for example Respondent 10:

“Various online brokers like Trussle and Habito seem to be making waves”

There was some scepticism about how “automated” these services really were. Respondent 7, a director of his own mortgage firm with 14 years industry experience said:

“Everyone is talking about systems like Habito/bank apps that allow customers to do the whole process themselves. However, the reality is that the customer just does some of the initial data entry themselves. So called “execution only” mortgages are not permitted by FCA regulation, so in reality behind the scenes they still have the same old tedious process”

Another respondent was clear that his main advantage as an independent mortgage advisor was that customers benefitted from the personal touch – he still visited people in their homes. Respondent 19 stressed that their service was about *“Expert advice [...] not just convenience”*. There were similar views for rates comparison sites, with respondents noting that finding a rate was “the easy part” and just the beginning of an application.

Some of the independent mortgage advisors identified that lenders improving their own process, through their apps and websites, was a major driver in customers going directly to their bank for the mortgage process. In particular 2 of the responses identified that lenders had made the process for remortgaging so much easier, that they were losing remortgage customers. Respondent 14:

“I miss a lot of remortgage work that I used to get because the customer just goes onto the bank website and clicks a few buttons to get a new fixed rate mortgage.”

However, the other side of this is that one bank employed advisor noted frustration that on occasions their own bank offered preferential rates to independent brokers, Respondent 9:

“Intermediates (like mortgage brokers) have completely different systems, and access different departments at the bank”

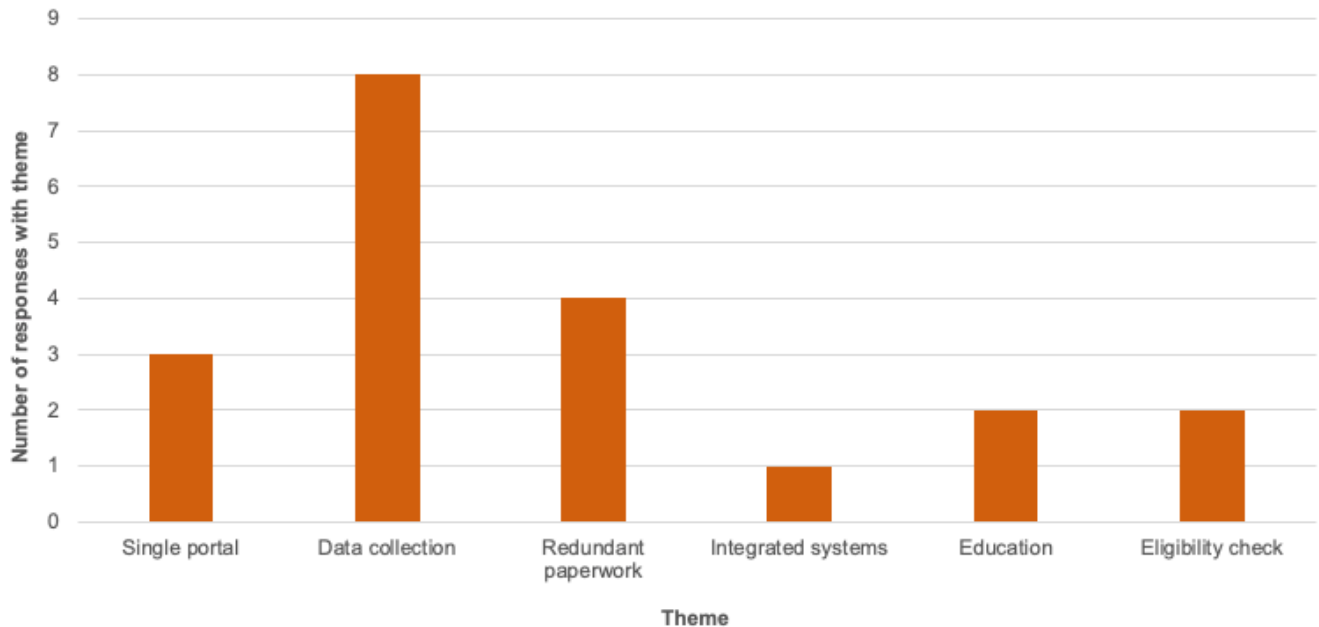
Multiple respondents referenced that many lenders were moving to portals for uploading customer evidence and communication (3 responses) rather than by the mortgage advisor emailing contacts at the lender; that there was a gradual shift towards e-signing rather than physical signing.

In summary the respondents saw various iterative emerging technologies, which make the process incrementally better for the consumer. Whilst there were some uncontroversial improvements (like improved lender portals), other improvements lenders have been making to streamline the process have led to less business for independent advisors. There was a general scepticism that the potentially more disruptive technologies, like automated online brokers and apps, actually worked or had any traction.

9.1.5 Improvement to the process

Question 7 of the qualitative survey asked “Where could improvements be made to the process”. The coding for this question was synthesized into 6 themes. In total 20 instances of these 6 themes appeared across the 19 responses, illustrated below in Figure 8.

Figure 8. Number of responses with themes for question 7 of the qualitative survey.



Source: Author's calculations

By far the largest theme was the need to improve data collection (8 responses). This correlates with the hurdles identified in Question 5. Respondents made suggestions of how this could be improved, included lenders having a single all-lender portal (3 responses) for uploading documents/data, integrating systems using open banking, and reducing redundant paperwork (4 responses).

Additionally multiple responses identified the need for an eligibility check process, without a full application, and the need for lenders to be more open about their requirements. Two respondents were keen for more to be done to educate customers about the right financial behaviours to be showing. This correlates with the friction points our respondents had identified for Question 5, especially related to first time buyers.

One respondent candidly identified that reducing complexity wasn't necessarily in their interest:

“I’m not that keen on improvements being made – because the process is complex I have a job”

Respondent 4 neatly summarised the situation:

“There are two parts to the mortgage process: one is administrative and the other advice. The administrative process is the most painful part – collecting documents, scanning them in, taking IDs, going through credit reports and bank statements. This is the bit that needs automating. The second part – actual financial advice is the reason people still come to us as independent advisors”

9.1.6 Qualitative survey summary

The picture that emerges is that the biggest friction point in the mortgage application process from the point of view of mortgage professionals, is the difficulty in accurately collecting financial data from customers, and then conveying it to the lender. The friction is not a financial advice one, but an administrative burden.

Whilst it's easier for remortgage customers, there is an education gap between what customers believe to be the case and the reality, especially when it comes to affordability requirements. This often causes customers to have to undergo a “financial hygiene” process.

Whilst there is an awareness of some emerging technologies our respondents were not actively involved in the process, and the impact felt by them was minimal.

9.2 Quantitative consumer survey data analysis

9.2.1 Frequency analysis

Below, in Table 5, is a summary of the number of responses to the questions, for the quantitative survey.

Table 5. Summary of responses to the quantitative consumer survey

		N	Marginal Percentage
Ease of Applying	Very Complex	237	23.7%
	Complex	253	25.3%
	Normal	141	14.1%
	Easy	213	21.3%
	Very Easy	156	15.6%
Gender	Male	574	57.4%
	Female	426	42.6%
Channel	On paper	422	42.2%
	Email	458	45.8%
	App	18	1.8%
	Website	102	10.2%
Ease vs Personal Loan	Easier	239	23.9%
	Similar	299	29.9%
	Harder	462	46.2%
Age	18-24	20	2.0%
	25-34	316	31.6%
	35-44	239	23.9%
	45-54	215	21.5%
	55-64	134	13.4%
	65+	76	7.6%
Valid		1000	100.0%
Missing		0	
Total		1000	

Source: Author's calculations

The survey indicates that 57.4% of the respondents who applied for a mortgage or remortgage in the last two years were males, 42.6% were females.

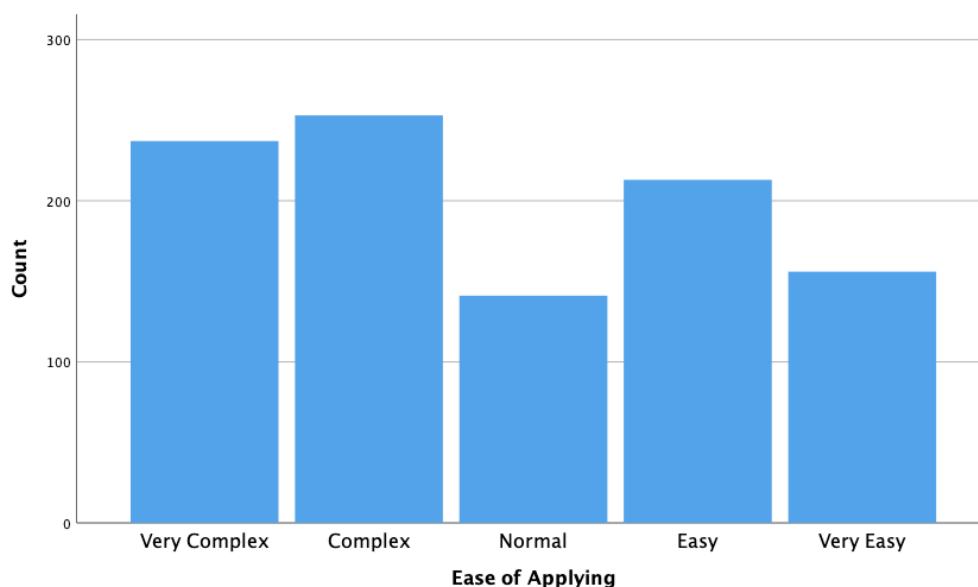
Based on the age data of the respondents, 31.6% of survey participants who took a mortgage in the last two years were aged between 25 and 34 years old; followed by 23.9% mortgage applicants aged between 35 and 44 years old; 21.5% between the ages of 45 and 54, and 13.4% aged 55-64. Whilst there were only 2% aged 24 or under, this is to be expected as buyers would need to have developed high enough savings and earnings to buy a house. However, surprisingly 7.6% of respondents were older than 65, which would typically be when someone is entering retirement and would have expected to own their house outright.

When asked what channel they used to send the mortgage documents to their mortgage advisor, 45.8% of respondents said that they used email, 42.2% completed it in a paper-based format. Only 10.2% of respondents said they used a website to send over their

mortgage application documents, and an even smaller proportion of only 1.8% of respondents said that they sent the documents through a smart phone application. These results suggest that even where advisor-to-lender transmission is moving to portals, end consumers interact with their mortgage advisor primarily through traditional application forms transmitted by scanning and emailing, or through the post.

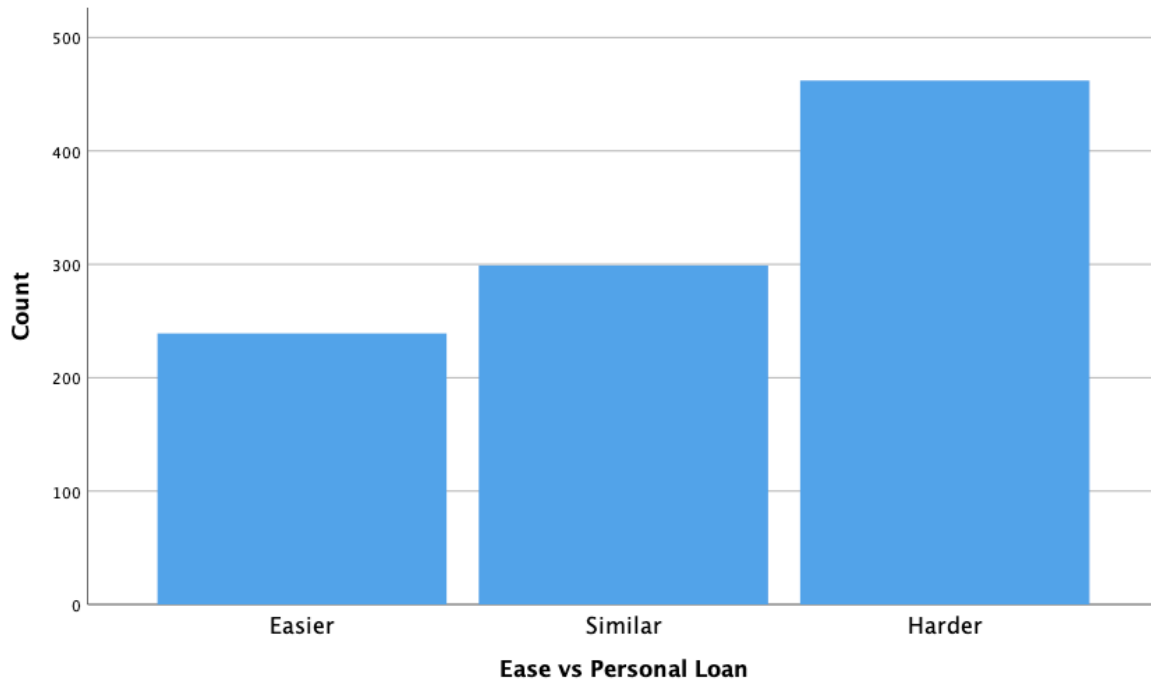
Among the 1000 survey respondents, 237 (23.7%) found the mortgage application process very complex, while another 253 (25.3%) found it complex. Only 141 (14.1%) respondents found the process normal/neither easy nor complex. However, 21.3% found the process easy, and 15.6% described the process as very easy. This means almost half of respondents found it at least complex. This fits the hypothesis that at the moment mortgage applications are difficult and complex tasks. These figures are illustrated below in Figure 9.

Figure 9. Difficulty of applying for a mortgage, based on the responses to the survey



Source: Author's calculations

When asked how the process of applying for a mortgage or remortgage online felt, when comparing with the application for other financial products, such as personal loans, credit cards or insurance, 29.9% of respondents said that it felt the same in terms of the process difficulty, whilst 46.2% found it harder than applying for other financial products. 23.9% of respondents felt that the mortgage process application was easier than that of a personal loan or insurance. This is illustrated in Figure 10 below.

Figure 10. Difficulty of applying for a mortgage, compared to other financial products

Source: Author's calculations

9.2.2 Cross tabling

Interestingly when we look at the cross-tabled data in Table 6 below, we see that where the application has been handled on paper a majority of respondents (59.8%) deemed the process to be “complex” or “very complex”. The converse is true when applying through a website, with 71.5% of website applicants seeing the process as “easy” or “very easy”. Email was the most equally spread, with 46.3% finding the process either “complex” or “very complex” and 33% viewing it as “easy” or “very easy”. This fits the perceived wisdom that an online process should be easier for customers than a more manual/traditional process.

Table 6. Cross table of results between ease of applying for mortgage and other questions

		Ease of Applying				
		Very Complex	Complex	Normal	Easy	Very Easy
Gender	Male	155 (27%)	125 (21.8%)	62 (10.8%)	133 (23.2%)	99 (17.2%)
	Female	82 (19.2%)	128 (30%)	79 (18.5%)	80 (18.8%)	57 (13.4%)
Ease vs Personal Loan	Easier	15 (6.3%)	17 (7.1%)	19 (7.9%)	121 (50.6%)	67 (28%)
	Similar	29 (9.7%)	35 (11.7%)	75 (25.1%)	78 (26.1%)	82 (27.4%)
	Harder	193 (41.8%)	201 (43.5%)	47 (10.2%)	14 (3%)	7 (1.5%)
Age	18-24	0 (0%)	10 (50%)	1 (5%)	9 (45%)	0 (0%)
	25-34	74 (23.4%)	68 (21.5%)	52 (16.5%)	71 (22.5%)	51 (16.1%)
	35-44	74 (31%)	74 (31%)	37 (15.5%)	23 (9.6%)	31 (13%)
	45-54	42 (19.5%)	78 (36.3%)	19 (8.8%)	44 (20.5%)	32 (14.9%)
	55-64	35 (26.1%)	20 (14.9%)	13 (9.7%)	47 (35.1%)	19 (14.2%)
	65+	12 (15.8%)	3 (3.9%)	19 (25%)	19 (25%)	23 (30.3%)
Channel	On paper	153 (36.3%)	99 (23.5%)	44 (10.4%)	90 (21.3%)	36 (8.5%)
	Email	81 (17.7%)	131 (28.6%)	94 (20.5%)	81 (17.7%)	71 (15.5%)
	App	0 (0%)	0 (0%)	0 (0%)	18 (100%)	0 (0%)
	Website	3 (2.9%)	23 (22.5%)	3 (2.9%)	24 (23.5%)	49 (48%)

Source: Author's calculations

We can see in Table 6, that there is a trend of the old age brackets finding the application process easier. With 35% of 55-64 year olds describing it as easy (compared to 22.5% for 25-34 year olds). A majority of those over 65 (55.3%) described the process as “easy” or “very easy”, whereas a majority of 35-44 year olds (62%) described the process as “complex” or “very complex”. This could perhaps be explained by the likelihood of older respondents having already completed a mortgage application in the past, and therefore being more familiar with the process.

9.2.3 Chi-square analysis

As our independent variables of age, gender and channel are nominal without a rank or order, we are able to use Chi-square as a correlation coefficient to test for independence, using the standard 95% percentile for significance ($p = 0.05$).

Chi-square test were run in turn against each independent variable and Ease of Applying. More details of the SPSS output are shown in Appendix 3. As the Chi-square test doesn't indicate how strong any association is, Cramer's V was also calculated to provide a measure of the size of the effect.

Gender

Chi-square shows there is a significant association between Ease of Applying and Gender. With Cramer's V indicating Gender has a medium sized effect on Ease of Applying.

$$\chi^2 = 27.77, p = .000, \text{Cramer's } V = .167$$

Channel

Chi-square shows there is a significant association between Ease of Applying and Channel. With Cramer's V indicating Channel has a medium sized effect on Ease of Applying.

$$\chi^2 = 234.784, p = .000, \text{Cramer's } V = .280$$

Age

Chi-square shows there is a significant association between Ease of Applying and Age. With Cramer's V indicating Age has a medium sized effect on Ease of Applying.

$$\chi^2 = 116.693, p = .000, \text{Cramer's } V = .171$$

Other products

Chi-square shows there is a significant association between Ease of Applying and Other Products. With Cramer's V indicating Other Products has a large sized effect on Ease of Applying.

$$\chi^2 = 551.057, p = .000, \text{Cramer's } V = .525$$

Therefore, all the variables we have collected in the survey have an association with Ease of Applying, with at least a medium sized effect on Ease of Applying, with the respondent's attitude to applying for other financial products having the largest effect.

9.2.4 Regression model results and analysis

An ordinal logistic regression analysis was run using the SPSS software package, a summary of the results is shown in Table 7 below.

Table 7. Ordinal logistic regression results for quantitative survey

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval			95% Confidence Interval	
							Lower Bound	Upper Bound	Exp B	Lower Bound	Upper Bound
Threshold	[Ease_of_applying = Very Complex]	-2.765	.324	72.810	1	.000	-3.400	-2.130	.063	.033	.119
	[Ease_of_applying = Complex]	-.979	.319	9.417	1	.002	-1.605	-.354	.376	.201	.702
	[Ease_of_applying = Normal]	.071	.321	.049	1	.826	-.559	.700	1.073	.572	2.014
	[Ease_of_applying = Easy]	1.747	.320	29.720	1	.000	1.119	2.375	5.735	3.061	10.746
Location	[Gender=Male]	-.203	.126	2.581	1	.108	-.450	.045	.816	.637	1.046
	[Gender=Female]	0 ^a	.	.	0	.	.	.	1.000		
	[Age=18-24]	-.711	.480	2.195	1	.139	-1.651	.230	.491	.192	1.258
	[Age=25-34]	-1.139	.244	21.774	1	.000	-1.618	-.661	.320	.198	.516
	[Age=35-44]	-.838	.252	11.040	1	.001	-1.332	-.344	.433	.264	.709
	[Age=45-54]	-.631	.250	6.395	1	.011	-1.120	-.142	.532	.326	.868
	[Age=55-64]	-.648	.267	5.896	1	.015	-1.171	-.125	.523	.310	.883
	[Age=65+]	0 ^a	.	.	0	.	.	.	1.000		
	[Channel=On paper]	-1.977	.224	78.236	1	.000	-2.415	-1.539	.138	.089	.215
	[Channel=Email]	-1.481	.217	46.562	1	.000	-1.906	-1.056	.227	.149	.348
	[Channel=App]	-1.104	.477	5.365	1	.021	-2.039	-.170	.331	.130	.844
	[Channel=Website]	0 ^a	.	.	0	.	.	.	1.000		
	[Ease_verse_personal_loan= Easier]	3.282	.184	316.666	1	.000	2.921	3.644	26.641	18.558	38.243
	[Ease_verse_personal_loan= Similar]	2.805	.168	279.106	1	.000	2.476	3.134	16.531	11.895	22.973
	[Ease_verse_personal_loan= Harder]	0 ^a	.	.	0	.	.	.	1.000	.033	.119

Link function: Logit.

a. This parameter is set to zero because it is redundant.

Source: Author's calculations using SPSS

The regression testing used the following reference categories:

- Ease of Applying = Very Easy
- Gender = Female
- Age = 65+
- Channel = Website
- Ease Verse Personal Loan = Harder

Using the standard 95th percentile for significance ($p < .05$), we can see in Table 6 that the majority of our data set is statistically significant, however, the following values were not statistically significant:

- Ease of Applying = Normal ($p = .826$)
- Gender = Male ($p = .108$)

- Age = 18-24 ($p = .139$)

Table 7 shows the Exp b (exponential beta) which is the odds ratio of the dependent variable (Ease of Applying) compared against the baseline reference categories. Looking at the odds ratio of all ages compared to the baseline (65+), the odds ratio are all less than 1. This means that all respondents younger than 65 are less likely to consider the ease of applying to be “very easy”.

Looking at the odds ratio for the different application channels, compared to applying through a website, the odds ratio are all less than 1. This means that all respondents who use a channel other than a website have lower probability of considering the ease of applying to be “very easy”.

Respondents who found it easier to apply for a mortgage than other financial products were 26.641 times more likely to find the mortgage application process “very easy”. Meaning those who found applying for a mortgage easier than other financial products, had a very high probability of finding a mortgage application very easy.

Our hypothesis was that we could use this equation to explain the relationship between variables:

$$\text{Ease_of_applying} = \alpha_0 + \alpha_1 \text{Gender} + \alpha_2 \text{Age} + \alpha_3 \text{Channel} + \alpha_4 \text{Ease_versus_personal_loan}$$

As Gender is not statistically significant, at a minimum the equation would need to be modified:

$$\text{Ease_of_applying} = \alpha_0 + \alpha_2 \text{Age} + \alpha_3 \text{Channel} + \alpha_4 \text{Ease_versus_personal_loan}$$

However, it does not appear that we are able to use “Age”, “Channel” & “Ease vs Personal Loan” alone as predictors of “Ease of Applying”. Using the Nagelkerke calculation (see Table 8 below) we can see that our model explains only 48.6% of the variance in the dependent variable. This means a majority of the variance is not explained by our model. Therefore, whilst it is clear there is some relationship between “Channel”, “Age” and “Ease Versus Personal Loan” and “Ease of Applying”, we aren’t able to provide a numerical calculation. Instead, there must be other factors involved in the equation, which we haven’t considered in this survey.

Table 8. Nagelkerke calculation for quantitative survey

Pseudo R-Square	
Cox and Snell	.465
Nagelkerke	.486
McFadden	.198
Link function: Logit.	

Source: Author's calculations using SPSS

10 Discussion, Conclusions and Recommendations

10.1 Limitations of results

10.1.1 Qualitative mortgage profession survey limitations

Both the quantitative and qualitative surveys were completed online. The mortgage professionals qualitative survey used LinkedIn as a means of identifying relevant target respondents. In order to qualify them, we looked through their profile to establish they had the relevant CeMAP qualification. Therefore, those that hadn't updated their profile, or who's profile was not made "public" wouldn't have been included. Additionally, whilst there are over 20,000 users with LinkedIn profiles featuring the "CeMAP" qualification, no doubt many mortgage professionals are not on there (see Appendix 1). As we only invited a modest 50 people to complete the survey, the sample may not have been representative of the whole industry.

Additionally, we did not attempt to generate a representative set of responses. Whilst we achieved a mix of independent advisors (employed and self-employed) and bank-employed advisors, only a quarter of responses were from bank-employed. With lenders conducting over a third of mortgages direct, this suggests our responses from bank employees are lower (IMLA, 2016) proportionately. It may be difficult to solicit responses from employees of large corporations like banks, as they are likely to be less free (or feel less free) to disclose information about their processes.

Care was taken to establish that those invited to participate were qualified, by reviewing their LinkedIn profile for relevant job roles and qualifications. However, this relied upon their LinkedIn profile being accurate. LinkedIn profiles are unverified, and an individual can represent any qualifications they like. Some mortgage professionals, in particular those that run firms, are publicly listed on FCA registers, however, employees are not publicly registered. To verify the users, and provide more reliable results, it would be necessary to request evidence of job roles and qualifications. However, this would create sizable friction in receiving responses.

Some of the most insightful responses were from those with over a decade in industry experience, and especially those that were directors of independent firms. An improvement to the qualitative interviews would have been to target specifically key-decision makers in the industry, for example senior directors in lenders.

Whilst the questions in the survey were open-ended, there was great discrepancy as to the depth of answers. A future step would be to follow-up, perhaps with a phone call, to attempt to extract more information on topics raised by the respondents, especially with a view to understand in greater depth some of the questions that arose from the initial data collection.

10.1.2 Quantitative consumer survey limitations

A critical analysis of the findings obtained from both the qualitative open-ended questionnaire and the quantitative survey reveals that there are several limitations and the results must be interpreted considering these limitations. One such limitation is that some respondents to the survey questionnaire may not have fully understood the questions, as there were minimal explanatory notes provided to them.

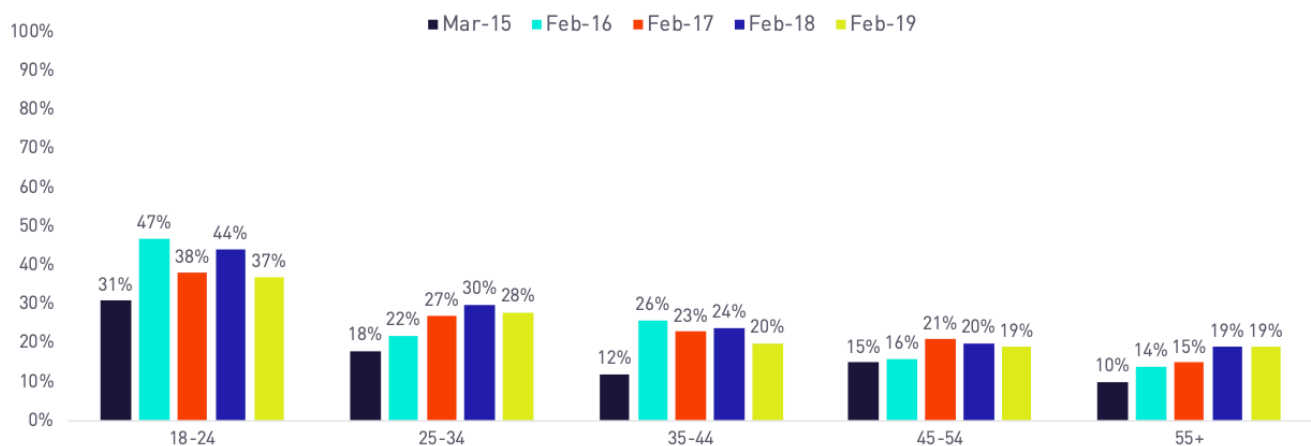
It could be that the order the questions were asked had an impact on results. For example if we asked the questions in reverse order, the memory that their mortgage was more complex than applying for a credit card might change how they respond when asked how their mortgage application process was. A solution to this, would be to show respondents the questions in randomised order. Additionally, rather than asking the respondent to make the comparison between the application process for other financial products and mortgages themselves, it might have been better to ask them to rank each financial product separately, and then calculate the relative difference ourselves.

In hindsight it would be better to have asked more questions about their specific mortgage application, for example to understand if the application was for their primary residence vs second homes, or buy-to-let investment properties. It would also have been preferable if were able to understand if any of our respondents were referring to equity release or second charge loans. Whilst these two products are both mortgages, their nature is very different to a typical mortgage/remortgage transaction.

Whilst consumers were asked what channel they used to apply, in interpreting the results it would have added large value to also have asked whether they applied through a broker/intermediary or directly to their lender.

The quantitative consumer survey utilised the Google Survey platform. This provided the ability to access a statistically significant number of consumers quickly and with relative ease. However, it is reliant on surveying those that will be exposed to the Google Ad platform. Those that are browsing websites that display Google Ads for the most time in their day, are more likely to be exposed to a survey. Therefore, those that are not on the internet at all, or on the internet less, are less likely to be exposed to the survey. This can skew the survey results to those that are most active internet users.

Additionally, the most technologically savvy users may well be deploying “ad block” technology. It is estimated that 23% (IAB UK, 2019) of UK internet traffic is running through an ad blocker. This would prevent those users from being exposed to this survey invite. There is large variance on usage of ad-block technology based on age, with 37% of those aged 18-24 range blocking ads (shown in Figure 11 below). In our quantitative survey under 2% of respondents were in this age bracket.

Figure 11. Percentage of UK internet users with ad blockers installed, by age group.

Source: IAB UK (2019)

When we are attempting to understand how technology can have an impact on the mortgage application process, it is potentially unhelpful to have a survey mechanism that excludes the most technologically advanced, and excludes the least technologically advanced. We found that those using the most technologically advanced application process (websites), were more likely to find it very easy, however, for them to have completed our survey they are not using ad-block technology and therefore less likely to be “sophisticated” technology users, it could be that the true gap in difficulty is larger than we found.

In our results we also see that there were differences in how hard users found the mortgage process based upon their age, so it could potentially skew results if we reduce the involvement of certain user age groups.

The Google Survey platform was configured to pre-qualify respondents by asking “Have you taken out a mortgage or remortgage in the last 2 years?”, and only allowing those that respond “Yes” to proceed. However, we have not verified that this is the case, as there is no verification of this. Another limitation of the Google Survey platform is that whilst it starts as a relatively inexpensive consumer research tool, the longer the survey the more expensive results are, as Google needs to divert the consumer for longer periods of time, this effectively limits the depth of questions that can be asked. Additionally, the more specific the demographic the more expensive the per response cost is. So by reducing the demographic to those that have taken out a mortgage in the last 6 months, the cost escalates – as Google has to show the survey to far more people to reach the required sample size of qualified respondents. This causes some conflict when investigating technology, as respondents that took out a mortgage two years ago might not have had the access to services/technology available now.

An alternative approach would be to partner with mortgage brokers and lenders, and then email the survey to their recent customers. This way they would be verified as genuine mortgage customers, who had recently completed their application.

10.2 Final conclusions

The purpose of this study was to:

- Understand the role technology plays at the moment in the application process for residential mortgages in the UK.
- Investigate what emerging technological innovations would provide disruption by comparing the UK mortgages with other similar financial products in the UK, and worldwide.
- Evaluate the competitive advantage that technological disruption will give lenders and brokers.
- Assess the demand from consumers for technological disruption in the UK residential mortgage market.
- Propose a theoretical framework for adopting technology as a positive driver for change across the UK residential mortgage industry.

It is clear that the *perceived gap* between the available disruptive technology and the technology that is being used in the mortgage market is a *real gap*.

Mortgage advisors find the mortgage application process administratively burdensome. They struggle to collect evidence, bank statements and details of other financial products from their customers, and they are frustrated about the amount of back-and-forth with the lenders. This is mirrored by consumers. Clearly where websites are used it does improve the experience, 71.5% of those using a website describing the process as “Easy” or “Very Easy” – compared to 29.8% for paper, and 33.2% for email. Yet, there is lack of adoption of these technologies.

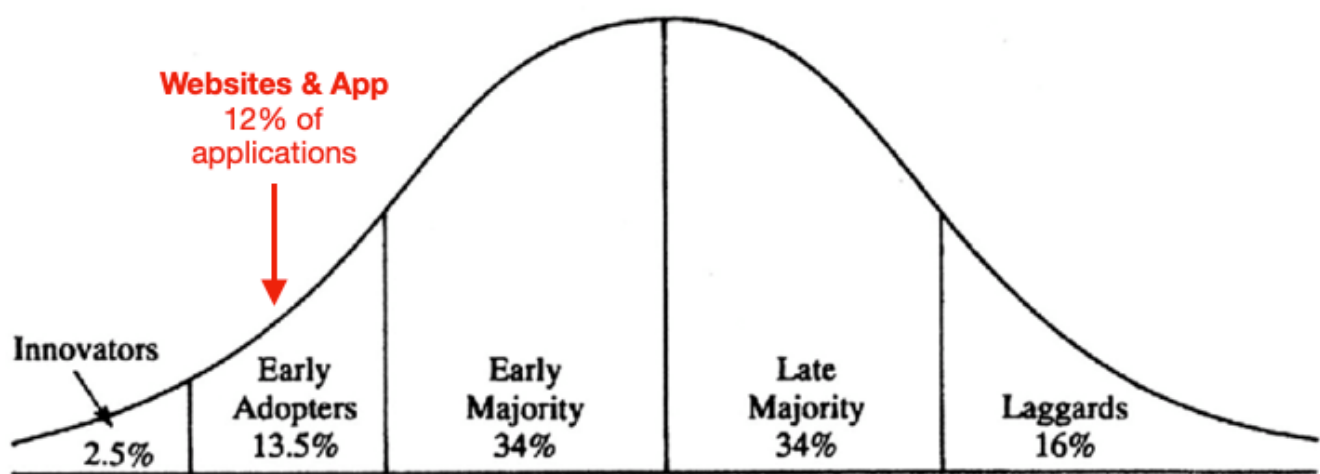
It is certainly the case that for almost all other financial products (from insurance to loans and credit cards) the majority of applications are conducted online, with the FCA estimating that under 3% of applications for credit cards are completed on paper (FCA, 2015). However, our quantitative survey, of a statistically significant sample, shows that 42% majority of consumers that took out a mortgage in the last two years completed the application through paper forms, and another 46% handled the transaction by email, which in many ways is analogous to handling the transaction by post (just with quicker delivery).

Whilst moving the mortgage application process from traditional PDF or printed application forms to websites wouldn't ordinarily be described as “disruptive innovation”, due to this

industry's very slow adoption of otherwise routine technologies, this could be "relatively disruptive".

Despite our data showing consumers find the process far easier when applying through an app or website, there is still relatively low uptake. Part of this can be explained with diffusion of innovation theory. Figure 4 (page 22) shows Rogers (2003) diffusion of innovation categories. From our consumer survey we've found that 12% of respondents applied for a mortgage through an app or website, this would place these technologies in Rogers' (2003) "Early Adopters" category. This is illustrated below in Figure 12.

Figure 12. Annotated diffusion of innovation adopter categories



Source: Rogers (2003) with Author's annotations.

This means the initial hurdle of being part of the 2.5% "innovators" category has already been passed. Rogers (2003) would view "early adopters" as having higher financial liquidity and advanced education, see a summary of his descriptors for each adopter category in Table 1 (page 22).

In order for these technology innovations to become more prevalent in the mortgage industry, it would be necessary to penetrate/progress through the adopter categories. For the next category ("early majority") to start to embrace the technology, it would require them to have contact with early adopters, and typically requires significantly longer time than early adopters (Rogers, 2003).

However, consumers are only part of the picture. It is likely that those applying through apps and websites were doing so directly with their lenders, rather than through independent brokers. Independent brokers act as intermediaries to the lender and are responsible for approximately 70% of mortgage transactions (IMLA, 2016). Typically mortgage brokers do

not charge the consumer a fee, instead they receive a “procuration fee” of circa 0.4% of the mortgage loan value (IMLA, 2016). As the lenders pay a fixed percentage to mortgage brokers, they are not incentivised to streamline the administrative burden for brokers – the broker is going to work with whatever antiquated system is in place, in order to earn their commissions.

The broker is the interface for most consumers applying for a mortgage, and with 87% of mortgage broker firms employing five or fewer advisers (Simon, 2020), they do not have the financial capability to invest in improving their technologies to gather information from consumers, therefore, have to rely on traditional paper based/email technologies.

This discrepancy goes some way to explain the slow evolution of technology in the industry. With the majority of their transactions coming through intermediaries, the lender is not incentivised to reduce the administrative burden on their intermediaries. In fact due to the burdens of evidencing affordability placed upon them by the FCA, lenders are incentivised to request more evidence from brokers, as the broker then incurs the compliance risk (IMLA, 2016).

Where lenders have seen low-risk opportunities to sell directly to consumers they are improving their technology offerings. The qualitative study highlights this is having the most traction with are remortgages. Approximately 80% of residential mortgages requiring personalised financial advice by the FCA (FCA Handbook, 2019), however, the key exception are remortgage transactions with the same lender. Our qualitative data indicates this is where lenders have invested in improving the process, building apps, and allowing customers to “self-serve”.

As mortgage brokers are the ones that end up undertaking the administrative burden, they are providing a cushion for consumers. Even if a lender improved the process for brokers, the consumer would see no benefit as they do not interact with it, and it is hard to see the competitive advantage that brokers could leverage owing to all other brokers also receiving that lender’s improved technology. With only around 340 mortgage lenders but in excess of 30,000 mortgage broker firms (FCA, 2020), there is a power discrepancy with individual broker firms being somewhat insignificant to a lender, and therefore less influential in driving the lender to implement technology improvements.

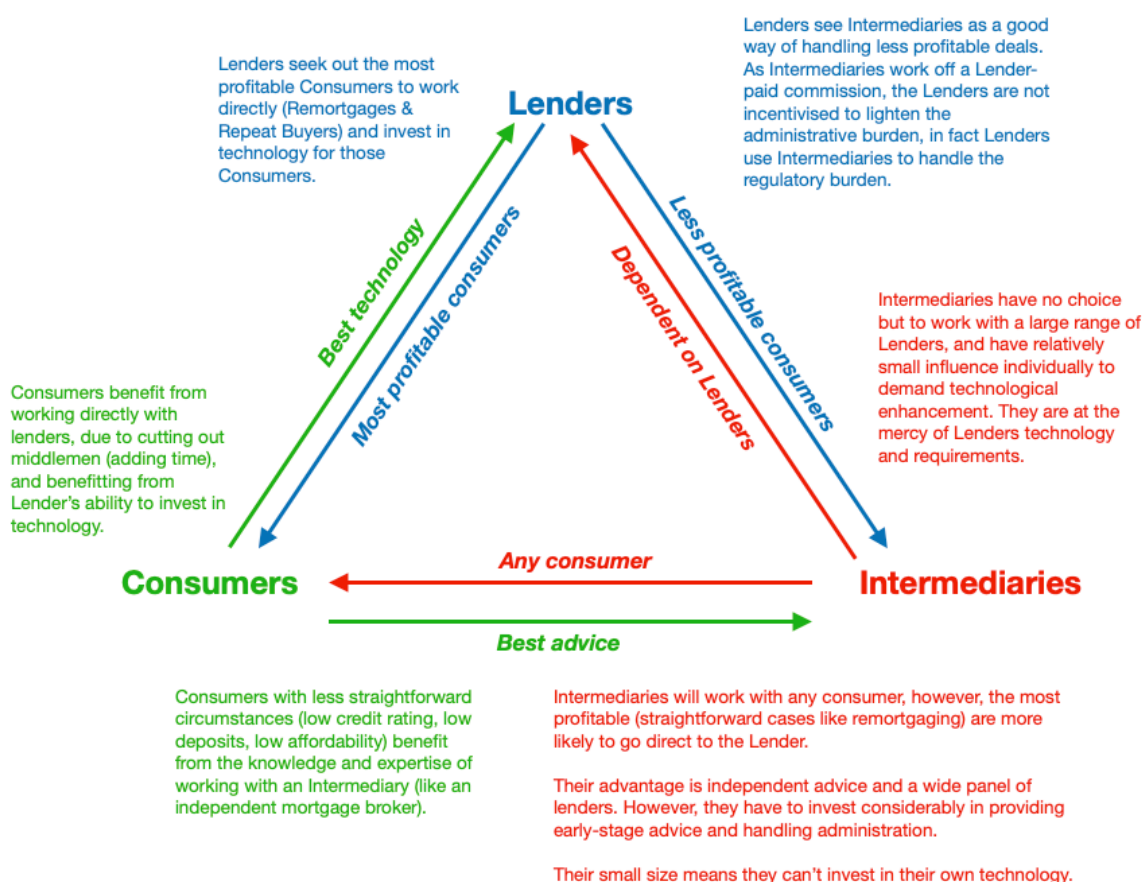
Therefore, if there is going to be major drivers of technology disruption in the industry, it has to be driven by brokers that are willing to invest in solving the administrative burdens themselves. This goes some way to explain why the technologies making the biggest inroads with our qualitative respondents are Trussle and Habito. Both of these are venture-backed technology companies, that whilst positioned as “FinTech” companies, are regulatorily independent mortgage brokers. Combined they have received in excess of £55 million in

venture capital funding (Crunchbase, 2020). This level of financial capital places these FinTech firms in a different league in their ability to both drive innovation and negotiate with lenders.

The mortgage professionals that responded to our qualitative survey were aware of these FinTech firms, and were largely sceptical that they were doing much different. Multiple respondents were clear that these firms only offered streamlined data collection, and that the backend process was similar to any other broker. Ultimately there are very hard limits as to what these FinTech firms would be able to innovate, as truly automated “robo-advice” for mortgages will not be possible in the current regulatory environment, as the FCA requires tailored advice for 80% of the current mortgage market. Whilst the idea of a regulatory sandbox could allow experimentation, our data shows that the accurate collection of data was the major complaint that our industry respondents had. Utilising Porter’s generic theory of competitive advantage (Porter, 1985) it would allow these FinTech firms to drive cost leadership by reducing their staffing costs.

A summary of this interplay in the relationships between Lenders, Consumers and Intermediaries is shown in Figure 13 below.

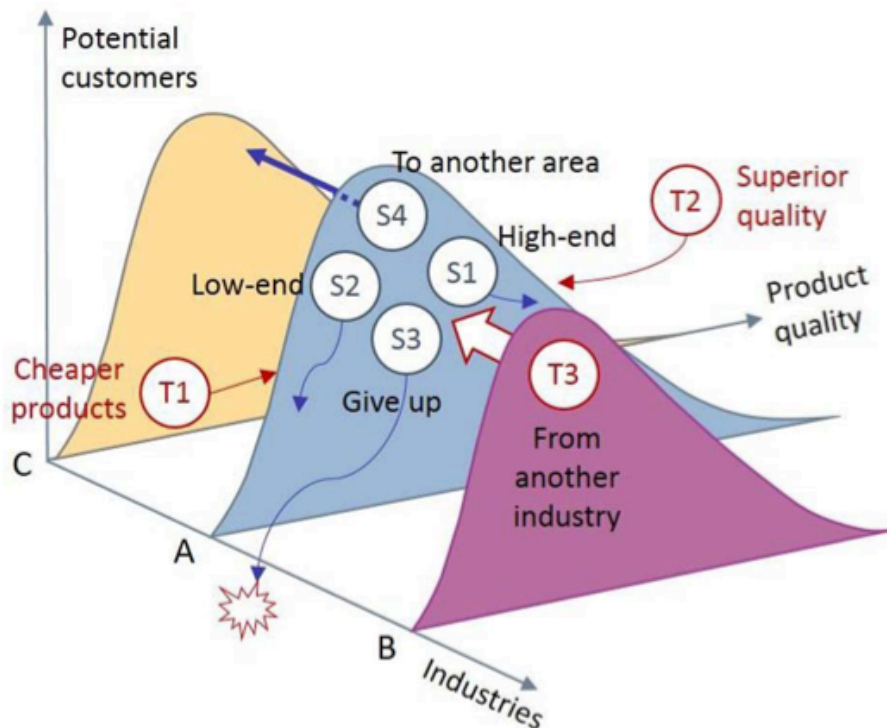
Figure 13. Relationship between Lenders, Consumers & Intermediaries



Source: Author.

Figure 3 (page 20) shows a diagram of a technology disruption framework from Kilkki et al. (2018), showing the layers of disruption and interplay between society, consumers, industries, firms and scientific communities. However, Kilkki additionally noted that the most critical business disruptions are usually made in firms (Kilkki et al, 2018), and developed this into a framework of strategic choices that firms need to make, illustrated in Figure 14 below.

Figure 14. Strategic choices for firms



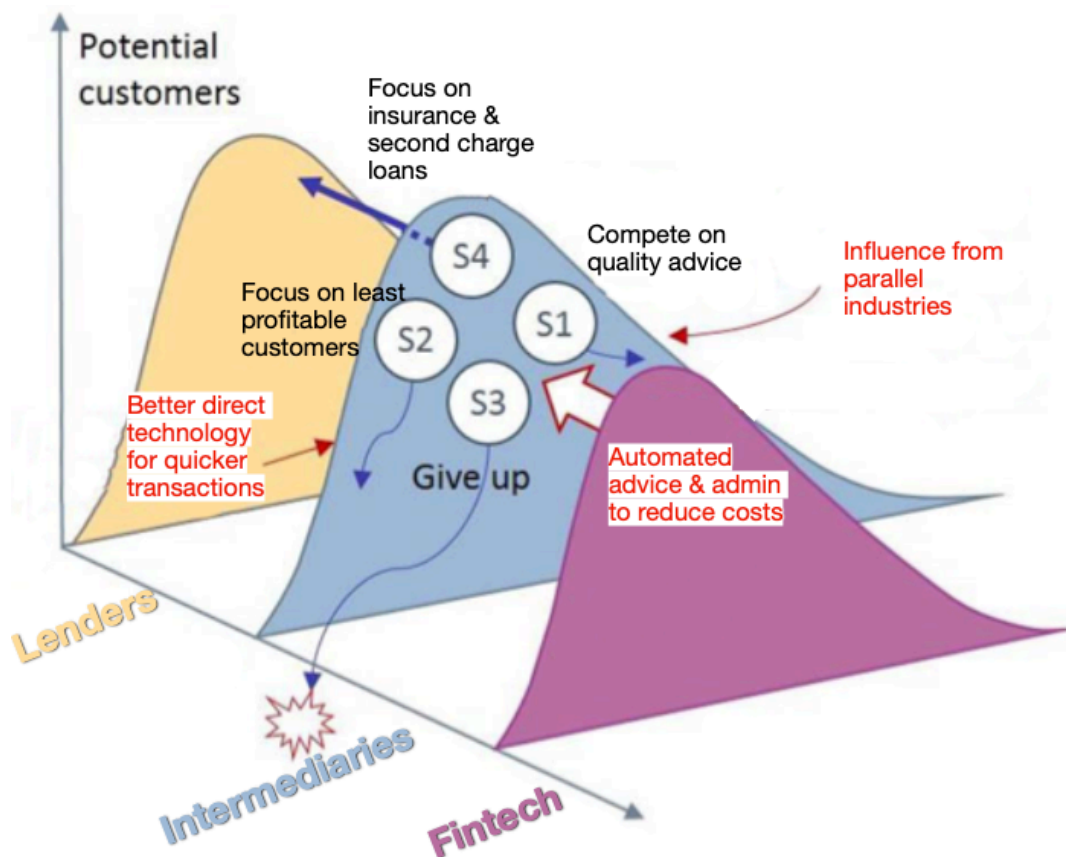
Three industries (A–C), three threats (T1–T3), and four strategies for incumbent players in industry A (S1–S4). Threats are made by disruptors while disruptees need to select a strategy to cope with the effects of a disruption.

Source: Kilkki et al. (2018).

It is clear that with mortgage application that the bulk of the market is currently controlled by intermediaries, however, these intermediaries are also the weakest link in the chain and with technological disruption will be the firms that are squeezed. They are able to be circumvented by the most profitable consumers, and have minimal influence on Lenders. They are also acting as sluggish incumbent market players providing a route into the industry for Fintech competitors (Christensen et al., 2015).

Therefore, a suggested theoretical framework for adopting technology in this industry is an adaptation of Kilkki's, illustrated in Figure 15 below.

Figure 15. Proposed framework for technology disruption in mortgage market.



Source: Kilkki et al. (2018), with adaptations by Author.

Lenders can drive growth by enhancing their technology offerings to approach the most profitable customers direct. Fintech companies can automate the administration and advice, to provide mass mortgage transactions cheaply and more profitably. Therefore, this leaves intermediaries with the need to move into other products, for example specialised lending like second charge mortgages and equity release mortgages, focus on their other incomes sources like insurances, or to compete on quality of advice and serve the least profitable customers.

10.3 Recommendations

10.3.1 Independent brokers

It is clear that independent brokers are at risk of creating the opportunity for FinTech businesses to cause technology disruption. Whilst they are currently not convinced that the FinTech players are doing anything differently, as incumbent market players they are showing the signs of being resistant to change. The independent brokers are not showing the necessarily willingness (or perhaps ability) to innovate and solve the problems that they themselves identify.

FinTech firms are targeting their ability to integrate with open banking, to automatically collect the evidence and data that is the bane of mortgage advisor's day-to-day admin. This is the area that interacts least with tough regulations, and could be a driver of cost savings, and convenience.

Whilst individual brokers may not have individual capacity to provide this innovation, there is room for technology suppliers to build solutions on their behalf.

10.3.2 Regulatory loosening

The period since the financial crash of 2008 has seen the tightening of affordability rules, and therefore the oversight on mortgage applications. Many of our professional qualitative respondents explained their power was in being able to provide advice to consumers – particularly about which lenders to approach for their individual circumstances. Whilst affordability requirements was a common theme, they were shown to be a bureaucratic and burdensome process, rather than a true assessment to secure credit.

If these affordability requirements have not genuinely changed the way lenders approve borrowers, then there is not advantage to them. The checks are mandated by the FCA, however, the FCA should review their genuine effectiveness at reducing unaffordable credit. With their removal the opportunity for innovation will grow as administrative burden is released. Lenders are currently happy for this expensive work to be born by their intermediaries, and it acts as a dis-incentive for them to grow their direct lending. However, with greater margins they will be incentivised to innovate their offerings and process for non-remortgage customers to approach them direct.

10.3.3 Education

A recurrent theme was that first-time buyers were poorly informed about the mortgage process, and whether they were eligible for a mortgage. There is clearly a wide-spread understanding that first-time buyers are more time-consuming (often taking years from first interaction to completing a mortgage transaction), and therefore less profitable.

Those firms (either brokers or lenders) that are able to engage and educate first time buyers, in an automated cost-effective fashion, will be able to capitalise on an underserved market.

11 Bibliography

- AFME & PwC. (2018). Technology and Innovation in Europe's Capital Markets. [online] Available at: <https://www.afme.eu/globalassets/downloads/publications/afme-pwc-tech-and-innovation-in-europes-capital-markets.pdf>. [Accessed 23 Oct. 2019].
- Agwu, E. (2013). From Reluctance to Resistance. *International Journal of Customer Relationship Marketing and Management*, 4(4), pp.41-56.
- Armitage, A. (2007). Mutual Research Designs: Redefining Mixed Methods Research Design. British Educational Research Association Annual Conference.
- Bartlett, R., Morse, A., Stanton, R. and Wallace, N. (2017). Consumer Lending Discrimination in the FinTech Era. *SSRN Electronic Journal*.
- Bookallil, S. and Birkby, V. (2017). 'Digital Change and Mortgage Borrowers'. Council of Mortgage Lenders. [online]. Available at: <https://www.cml.org.uk/documents/digital-change-and-mortgage-borrowers/digital-change-and-mortgage-borrowers.pdf>. [Accessed 23 Oct. 2019].
- Bradley, F. (2005). *International marketing strategy*. 5th ed. Harlow: Financial Times Prentice Hall.
- Braun, V. and Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), pp.77-101.
- Bryman, A., and Bell, E. (2015). *Business research methods*. Oxford: OUP.
- Chong, D. (2015). Class War on Wonga. *Journal of Visual Culture*, 14(2), pp.236-242.
- Chou, D. C., and Chou, A. Y. (2000). 'A guide to the Internet revolution in banking'. *Information Systems Management*, 17(2). pp: 51-57.
- Christensen, C. (1997). *The Innovator's dilemma*. 1st ed. New York: Collins business essentials.
- Christensen, C., Raynor, M. and McDonald, R. (2015). What Is Disruptive Innovation? [online] *Harvard Business Review*. Available at: <https://hbr.org/2015/12/what-is-disruptive-innovation> [Accessed 22 Oct. 2019].
- Clark, E. (2018). Would you use an online mortgage broker? [online] *Which? News*. Available at: <https://www.which.co.uk/news/2018/08/would-you-use-an-online-mortgage-broker/> [Accessed 5 June 2019].
- Conslick, J. (1996). 'Why bounded rationality?'. *Journal of Economic Literature*, 34. pp: 669-700.
- Consoli, D. (2005). The dynamics of technological change in UK retail banking services: An evolutionary perspective. *Research Policy*, 34(4), pp.461-480.
- Creswell, J. and Plano Clark, V. (2007). *Designing and conducting mixed methods research*. 1st ed. Thousand Oaks, CA: Sage.
- CROSMAN, P. (2018). A Mortgage in 30 Minutes? Fintech Says It's Coming. *National Mortgage News*, 42(11), p.13.

- Crotty, M. (1998). *The Foundations of Social Research*. London: SAGE.
- Crunchbase. 2020. *Investment Data For Trussle*. [online] Available at: <https://www.crunchbase.com/organization/trussle> [Accessed 26 April 2020].
- Crunchbase. 2020. *Investment Data For Habito*. [online] Available at: <https://www.crunchbase.com/organization/hey-habito> [Accessed 26 April 2020].
- Danneels, E. (2004). Disruptive Technology Reconsidered: A Critique and Research Agenda. *Journal of Product Innovation Management*, 21(4), pp: 246-258.
- Debreu, G. (1959). *Theory of Value: An Axiomatic Analysis of Economic Equilibrium*. Yale University Press: New Haven, CT.
- Dietrich, J. (2005). 'Searching for Age and Gender Discrimination in Mortgage Lending'. Office of the Comptroller of the Currency. Economics Working Paper 2005-2.
- Easterby-Smith, M., Jackson, P. and Thorpe, R. (2012). *Management Research*. London: SAGE.
- FCA. 2015. *Market Overview*. [online] Available at: <<https://www.fca.org.uk/credit-card-market-study-interim-report/market-overview>> [Accessed 26 April 2019].
- FCA. (2016). About the FCA. April 21. [online] Available at: <https://www.fca.org.uk/about/the-fca>. [Accessed 5 June 2019].
- FCA. (2018). *Mortgages Market Study*. [online] Available at: <https://www.fca.org.uk/publication/market-studies/ms16-2-2-interim-report.pdf> [Accessed 5 June 2019].
- FCA Handbook. (2019). MCOB 4.7A Advised sales - FCA Handbook. [online] Available at: <https://www.handbook.fca.org.uk/handbook/MCOB/4/7A.html> [Accessed 5 June 2019].
- FCA. 2020. *Mortgage Lending Statistics - March 2020*. [online] Available at: <https://www.fca.org.uk/data/mortgage-lending-statistics> [Accessed 26 April 2020].
- Fielding, N. (2012). Triangulation and Mixed Methods Designs. *Journal of Mixed Methods Research*, 6(2), pp.124-136.
- Fuster, A., Plosser, M., Schnabl, P. and Vickery, J. (2018). The Role of Technology in Mortgage Lending. SSRN Electronic Journal.
- GILBERTSON, B. (2007). What Is Driving the Change in the U.K. Retail Market?. *Real Estate Issues*, 32(2), pp.41-44.
- Gonzalez, L. and McAleer, K. (2014). Determinants of Success in Online Social Lending: A Peak at US Prosper & UK Zopa. SSRN Electronic Journal.
- Gough, O. (2016). London now fintech capital of EU, but Brexit changes everything. [online] Small Business. Available at: <https://smallbusiness.co.uk/london-fintech-capital-brexit-changes-2534761/> [Accessed 17 Jan. 2019].
- GRANTHAM, D. (2014). Technology disruption: 'It's not always this crazy'. *Behavioral Healthcare*, 34(2), pp.44-5.

- Groenewald, T. (2004). A Phenomenological Research Design Illustrated. *International Journal of Qualitative Methods*, 3(1), pp.42-55.
- Gujarati, D. N. (2009). *Basic Econometrics*. 5th ed. New Delhi, India: McGraw-Hill Education.
- Henshaw, S. (2018). Mobile Phone Usage Statistics in the UK: How Many Smartphone Users Are There. [online] Available at: <https://www.tigermobiles.com/blog/mobile-phone-usage-statistics>. [Accessed 5 June 2019].
- Hamilton, J. C. (1999). 'The Ethics of Conducting Social-Science Research on the Internet'. *The Chronicle of Higher Education*, 46(15). B6-7.
- HIGGINBOTHAM, A. (2018). Fintech Innovation Is Becoming a Must-Have for Mortgage Lenders. *National Mortgage News*, 43(4), p.20.
- Hirsch-Kreinsen, H. (2011). 'Financial Market and Technological Innovation'. *Industry and Innovation*, 18(4). pp: 351-368.
- IAB UK. "Ad Blocking - Consumer Usage and Attitudes." *Internet Advertising Bureau UK*, Feb. 2019, www.iabuk.com/sites/default/files/public_files/Ad%20Blocking%202019_0.pdf.
- IMLA. (2019). The new 'normal' – prospects for 2018. [online] Available at: <http://www.imla.org.uk/resources/publications/the-new-normal-prospects-for-2018.pdf> [Accessed 17 Jan. 2019].
- IMLA. (2016). The changing face of mortgage distribution. [online] Available at: <http://www.imla.org.uk/resources/publications/the-changing-face-of-mortgage-distribution.pdf> [Accessed 17 Jan. 2019].
- IRESS. (2018). Intermediary Mortgage Survey Report 2018. [online] Iress.com. Available at: <https://www.iress.com/uk/resources/insight-research/intermediary-mortgage-survey-report-2018/> [Accessed 22 Oct. 2019].
- Irrera, A. and Krouse, S. (2014). Race to be the big wheel in fintech. *Fintech News*, 2.
- Jeff, L. (2015). Navigating the four themes of technology disruption. [online] Ey.com. Available at: [https://www.ey.com/Publication/vwLUAssets/EY-four-themes-describe-historic-change-in-the-technology-sector/\\$FILE/EY-four-themes-describe-historic-change-in-the-technology-sector.pdf](https://www.ey.com/Publication/vwLUAssets/EY-four-themes-describe-historic-change-in-the-technology-sector/$FILE/EY-four-themes-describe-historic-change-in-the-technology-sector.pdf) [Accessed 17 Jan. 2019].
- Joppe, M. (2000). The Research Process. *The Quantitative Report Journal*, 8(4), pp.597-607.
- Joseph, M., Sekhon, Y., Stone, G. and Tinson, J. (2005). An exploratory study on the use of banking technology in the UK. *International Journal of Bank Marketing*, 23(5), pp.397-413.
- Joseph, M., Sekhon, Y., Stone, G. and Tinson, J. (2005). An exploratory study on the use of banking technology in the UK. *International Journal of Bank Marketing*, 23(5), pp.397-413.
- Johnson, H. G. (1958). 'Demand Theory Further Revised or Goods are Goods', *Economica*, N. S. 25.
- Kelle, U. (2006). 'Combining qualitative and quantitative methods in research practice: purposes and advantages'. *Qualitative Research in Psychology*, 3(4). pp: 293-311.

- Kilki, K., Mäntylä, M., Karhu, K., Hämmäinen, H., Ailisto, H. (2018). 'A disruption framework'. *Technological Forecasting & Social Change*, 129. pp: 275-284.
- Kintzer, F. C. (1977). 'Advantages of open-response questions in survey research'. *Community Junior College Research Quarterly*, 2(1). pp: 37-46.
- Koblyakova, A. and White, M. (2016). Supply driven mortgage choice. *Urban Studies*, 54(5), pp.1194-1210.
- Kostoff, R. N., Boylan, B. and Simons, G. R. (2004). 'Disruptive technology roadmaps'. *Technological Forecasting and Social Change*, 71(1). pp: 141-159.
- Kotler, P. and Armstrong, G. (2010). *Principles of Marketing*. 12th ed. NJ: Prentice Hall.
- KPMG. (2018). *Buyers Market Future of Mortgages*. [online] Available at: <https://assets.kpmg/content/dam/kpmg/uk/pdf/2018/07/buyers-market-future-of-mortgages.pdf> [Accessed 17 Jan. 2019].
- Krämer, A., Tachilzik, T. and Bogaerts, R. (2016). 'Technology and Disruption: How the New Customer Relationship Influences the Corporate Strategy'. In: Khare A., Stewart B., Schatz R. (eds) *Phantom Ex Machina*. Springer, Cham. pp: 53-70.
- Labuschagne, A. (2003). 'Qualitative Research – Airy Fairy or Fundamental?'. *The Qualitative Report*, 8(1). pp: 100-103.
- Leonard-Barton, D. (1992). 'Core capabilities and core rigidities: A paradox in managing new product development'. *Strategic Management Journal*, (Summer, 13). pp: 111-125.
- Leung, W.-C. (2001). 'How to design a questionnaire'. *BMJ*, 322. Available at: <http://pdfs.semanticscholar.org/fc91/8c28a74821a28efde09665018793c35c3381.pdf>. (Accessed: 12 February 2020).
- Liu, J. (2015). [online] Ey.com. Available at: [https://www.ey.com/Publication/vwLUAssets/EY-four-themes-describe-historic-change-in-the-technology-sector/\\$FILE/EY-four-themes-describe-historic-change-in-the-technology-sector.pdf](https://www.ey.com/Publication/vwLUAssets/EY-four-themes-describe-historic-change-in-the-technology-sector/$FILE/EY-four-themes-describe-historic-change-in-the-technology-sector.pdf) [Accessed 7 Jan. 2019].
- MCGEER, B. (2017). A Community Banker's Fintech 'Aha' Moment. *American Banker Magazine*, 127(4), p.3.
- MCGEER, B. (2017). A Community Banker's Fintech 'Aha' Moment. *American Banker Magazine*, 127(4).
- Mertens, D. (2009). *Transformative Research and Evaluation*. New York: Guilford Press.
- Meyer, T. (2017). Online P2P Lending Nibbles At Banks' Loan Business. *Deutsche Bank Research*.
- Miles, D. (2005). Incentives Information and Efficiency in the UK Mortgage Market. *The Economic Journal*, 115(502), pp.C82-C98.
- Miles, D. (2005). Incentives Information and Efficiency in the UK Mortgage Market. *The Economic Journal*, 115(502), pp.C82-C98.
- Morgan, D. (2007). Paradigms Lost and Pragmatism Regained. *Journal of Mixed Methods Research*, 1(1), pp.48-76.

Morgan, R. (2017). The Top Fintech Trends Driving the Next Decade. American Bankers Association Banking Journal.

Mortgage Finance Gazette. (2018). A wealth of data within mortgage statistics. [online] Available at: <https://www.mortgagefinancegazette.com/features/wealth-data-within-mortgage-statistics-11-04-2018/> [Accessed 17 Jan. 2019].

Nagy, D., Schuessler, J. and Dubinsky, A. (2016). 'Defining and identifying disruptive innovations'. Industrial Marketing Management, 57. pp: 119-126.

O'Byrne, P. (2007). 'The advantages and disadvantages of mixing methods: An analysis of combining traditional and autoethnographic approaches'. Qualitative Health Research, 17(10). pp: 1381-1391.

Patton, M. (2002). Qualitative research & evaluation methods. 3rd ed. Thousand Oaks, Calif.: Sage.

Porter, M. (1980). Competitive strategy. 1st ed. New York: Free Press.

Porter, M. (1985). Competitive Advantage: Creating and Sustaining Superior Performance. 1st ed. NY: Simon and Schuster.

Rahman, M. S. (2017). 'The Advantages and Disadvantages of Using Qualitative and Quantitative Approaches and Methods in Language "Testing and Assessment" Research: A Literature Review'. Journal of Education and Learning, 6(1). pp: 102-112.4

RICHARDSON, D., KATINAITE, V. and MANNING, M. (2010). Evolution of the UK banking system. Bank of England. Quarterly Bulletin, 50(4), pp.321-332.

Rogers, E., 2003. *Diffusion Of Innovations*. 5th ed. New York: Freepress.

ROWLINGSON, K., APPLEYARD, L. and GARDNER, J. (2016). Payday lending in the UK: the regul(aris)ation of a necessary evil?. Journal of Social Policy, 45(03), pp.527-543.

Ryan, A. B. (2006). 'Post-positivist approaches to research'. Researching and Writing your Thesis: a guide for postgraduate students, pp.12-26.

Sanchez, O. M. C., Muñoz, M. H. S., and Dominguez, O. F. C. (2017). 'Disruptive innovation: an approach from business model for the Latin American context'. Review of Socio-Economic Perspectives, 2(2). pp: 107-123.

Saunders, M., Lewis, P., Thornhill, A. & Bristow, A., 2016. Research Methods for Business Students. 7th ed. Harlow: Pearson.

Scanlon, K. and Whitehead, C. (2011). The UK mortgage market: responding to volatility. Journal of Housing and the Built Environment, 26(3), pp.277-293.

Schumpeter, J. A. (1950). Capitalism, Socialism and Democracy, (3rd ed.). New York: Harper Collins.

Shiller, R. J., 2012. The subprime solution: How today's global financial crisis happened, and what to do about it. Princetown: PUP.

Simon, E., 2020. *Mortgage Brokers See Earnings Double In Five Years: FCA - Mortgage Strategy*. [online] Mortgage Strategy. Available at:

<https://www.mortgagestrategy.co.uk/news/mortgage-brokers-see-earnings-double-in-five-years-fca> [Accessed 26 April 2020].

Signaturit. (2018). GDPR: What implications does it have for FinTech companies? [online] Signaturit.com. Available at: <https://blog.signaturit.com/en/gdpr-what-implications-does-it-have-for-fintech-companies>. [Accessed 5 June 2019].

Simon, HA. (1979). *Models of Thought*. New Haven, CT: Yale University Press.

SINNOCK, B. (2017). Can Fintech Speed Up Mortgage Closings?. *National Mortgage News*, 41(10), p.12.

Snook, R., Fisher, T. and Durham, J. (2018). UK housing market outlook. [online] Pwc.co.uk. Available at: <https://www.pwc.co.uk/economic-services/ukey/ukey-july18-uk-housing-market-outlook.pdf> [Accessed 17 Jan. 2019].

Sorohan, M. (2019). 'How technology is changing the mortgage industry'. *MBA Insights*, April 8. [online] Available at: <https://www.mba.org/publications/insights/archive/mba-insights-archive/2019/how-technology-is-changing-the-mortgage-industry-x235768>. [Accessed 24 October 2019].

Teddlie, C. and Tashakkori, A. (2010). *Foundations of mixed methods research*. Los Angeles: SAGE Publ.

Teece, D., Pisano, G. and Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), pp: 509-533.

Teece, D. (2018). 'Business models and dynamic capabilities'. *Long Range Planning*, 51(1). pp: 40-49.

Tellis, G. and Sood, A. (2011). *Challenges of Technological Evolution in Contemporary Markets*. SSRN Electronic Journal.

The London Institute of Banking & Finance. (n.d.). 'Certificate in Mortgage Advice and Practice (CeMAP)'. Available at: [https://www.libf.ac.uk/study/professional-qualifications/mortgage-advice/certificate-in-mortgage-advice-and-practice-\(cemap\)](https://www.libf.ac.uk/study/professional-qualifications/mortgage-advice/certificate-in-mortgage-advice-and-practice-(cemap)). (Accessed: 12 February 2020).

Trochim, W. (2006). *Research Methods Knowledge Base*. 2nd ed. Mason, Ohio: Cengage Learning.

UK Gov. (2018). Guide to the General Data Protection Regulation. [online] Gov.uk. Available at: <https://www.gov.uk/government/publications/guide-to-the-general-data-protection-regulation>. [Accessed 5 June 2019].

UWTSD. (2017). Research Ethics & Integrity Code of Practice. [online] Available at: <https://www.uwtسد.ac.uk/media/uwtسد-website/content-assets/documents/research/research-ethics-integrity-code-practice.pdf> [Accessed 5 June 2019].

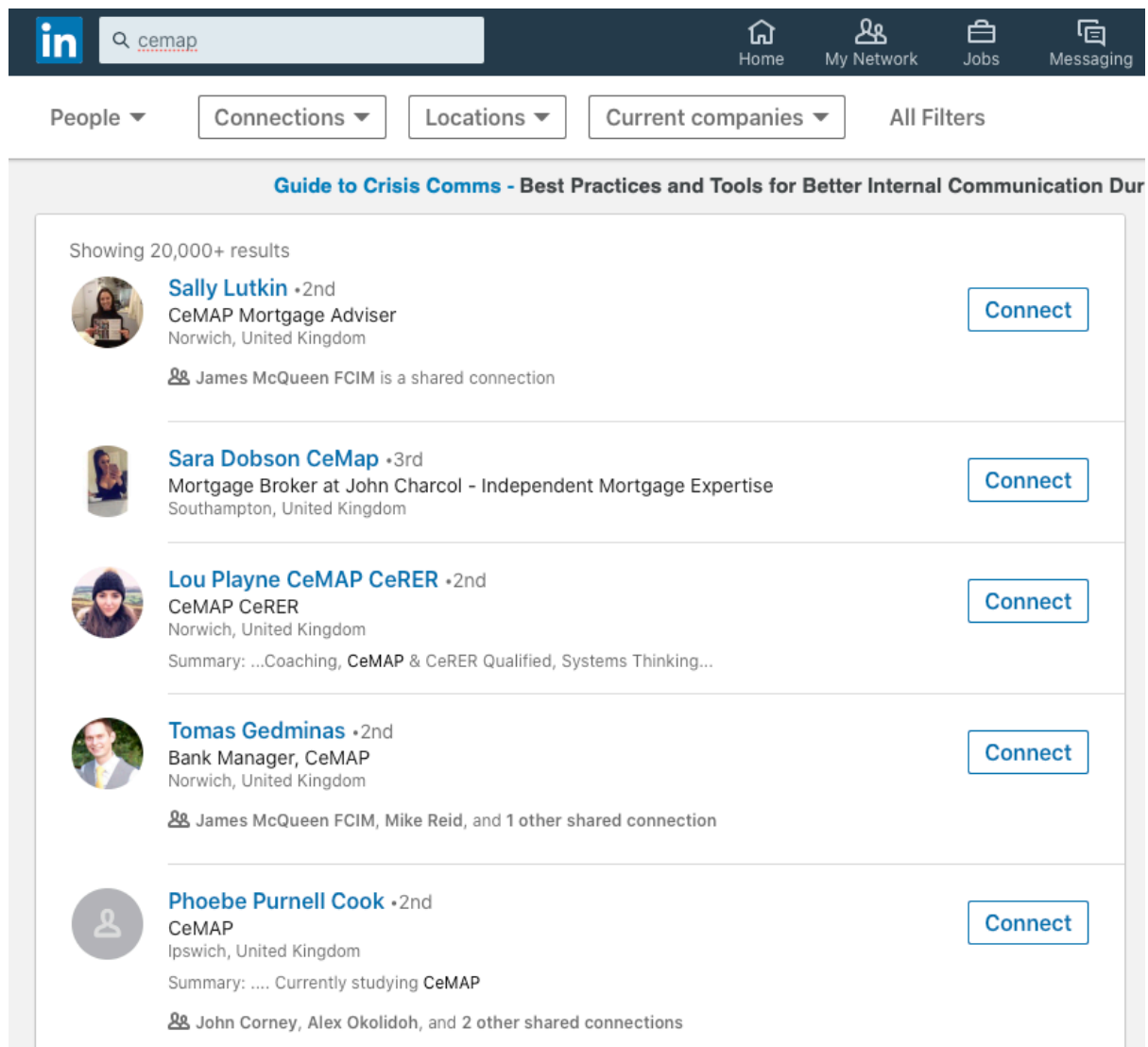
Van Dijk, R. and Garga, S. (2006). [online] Oxera.com. Available at: <https://www.oxera.com/wp-content/uploads/2018/03/UK-mortgage-underwriting.pdf> [Accessed 17 Jan. 2019].

- Vives, X. (2017). The Impact of Fintech on Banking. [online] European Economy Banks, Regulation, and the Real Sector. Available at: http://blog.iese.edu/xvives/files/2018/02/EE_2.2017.pdf#page=99 [Accessed 17 Jan. 2019].
- Venkatash, V. and Davis, F. D., 2000. A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management science*, 46(2), pp: 186-204.
- Veuger, J. (2018). 'Trust in a viable real estate economy with disruption and blockchain'. *Facilities*, 36(1/2). pp: 103-120.
- Wang, Z., Zhao, H., & Wang, Y. (2015). Social networks in marketing research 2001–2014: a co-word analysis. *Scientometrics*, 105(1), 65-82.
- Wagner, C., Kawulich, B., Garner, M. and Botha, A. (2012). *Doing social research*. New York: McGraw-Hill Higher Education.
- Ward, D. (2009). Product differentiation and consumption efficiency in mortgage markets. *Journal of Business Research*, 62(8), pp.805-809.
- Wen-Cheng, W., Chien-Hung, L. and Ying-Chien, C. (2011). Types of Competitive Advantage and Analysis. *International Journal of Business and Management*, 6(5).
- Wen-Cheng, W., Chien-Hung, L. and Ying-Chien, C. (2011). Types of Competitive Advantage and Analysis. *International Journal of Business and Management*, 6(5).
- Wright, K. B. (2017). 'Researching Internet-Based Populations: Advantages and Disadvantages of Online Survey Research, Online Questionnaire Authoring Software Packages, and Web Survey Services'. *Journal of Computer-Mediated Communication*, 10(3). doi: 10.1111/j.1083-6101.2005.tb00259.x.

12 Appendices

12.1 Appendix 1 – Qualitative Survey

Figure 16. Sample LinkedIn search for qualified mortgage professionals.



Source: Author.

Figure 17. Sample message included in the invitation to the LinkedIn qualitative questionnaire

Hi <name>

I'm currently conducting research for my dissertation, which is on technological advancement in the mortgage industry.

Would you be able to take some time to complete this short survey? All data collected is anonymous.

Please do not disclose any information that is commercially sensitive or confidential.

<Google form link>

Thanks,

Basil

Source: Author.

Fig 18. Qualitative Open-Ended Questionnaire

Google Form questions:

- 1 - What's your job title?
- 2 - What sort of firm do you work for?
- 3 - How much experience do you have in the mortgage market?
- 4- Can you explain the process people normally go through to take out a mortgage?
- 5 - What are the biggest delays and hurdles in the process?
- 6 - What emerging technology are you aware of?
- 7 - Where could improvements be made to the process?

Source: Author.

Fig 19. Sample response to open-ended questionnaire**1 - What's your job title?**

Mortgage Advisor

2 - What sort of firm do you work for?

A bank

3 - How much experience do you have in the mortgage market?

3 years

4- Can you explain the process people normally go through to take out a mortgage?

As I'm not an independent advisor I only provide advice about our bank's products. People normally come to us because we hold their current account. I'll do an initial factfind to establish their financial situation, and then using our internal system we see what we'd be prepared to lend them.

We can normally produce an acceptance in principle quickly, but it takes longer to produce a full offer.

5 - What are the biggest delays and hurdles in the process?

If we're able to lend, it's normally a fairly smooth process, as we normally already have full access to their bank accounts (if they bank with us), and we will already have all their ID on record. It's more complicated if they are taking a mortgage out with a partner who doesn't bank with us.

6 - What emerging technology are you aware of?

Our bank has really improved the process for remortgaging – if you stay with us, it's not just a few clicks to get a new fixed rate period at the end of your current period.

7 - Where could improvements be made to the process?

One of the biggest improvements would be automation of data collection. There's so much we already know about the customer – it would be easier if the computer system pulled that all in together for us.

Source: Author.

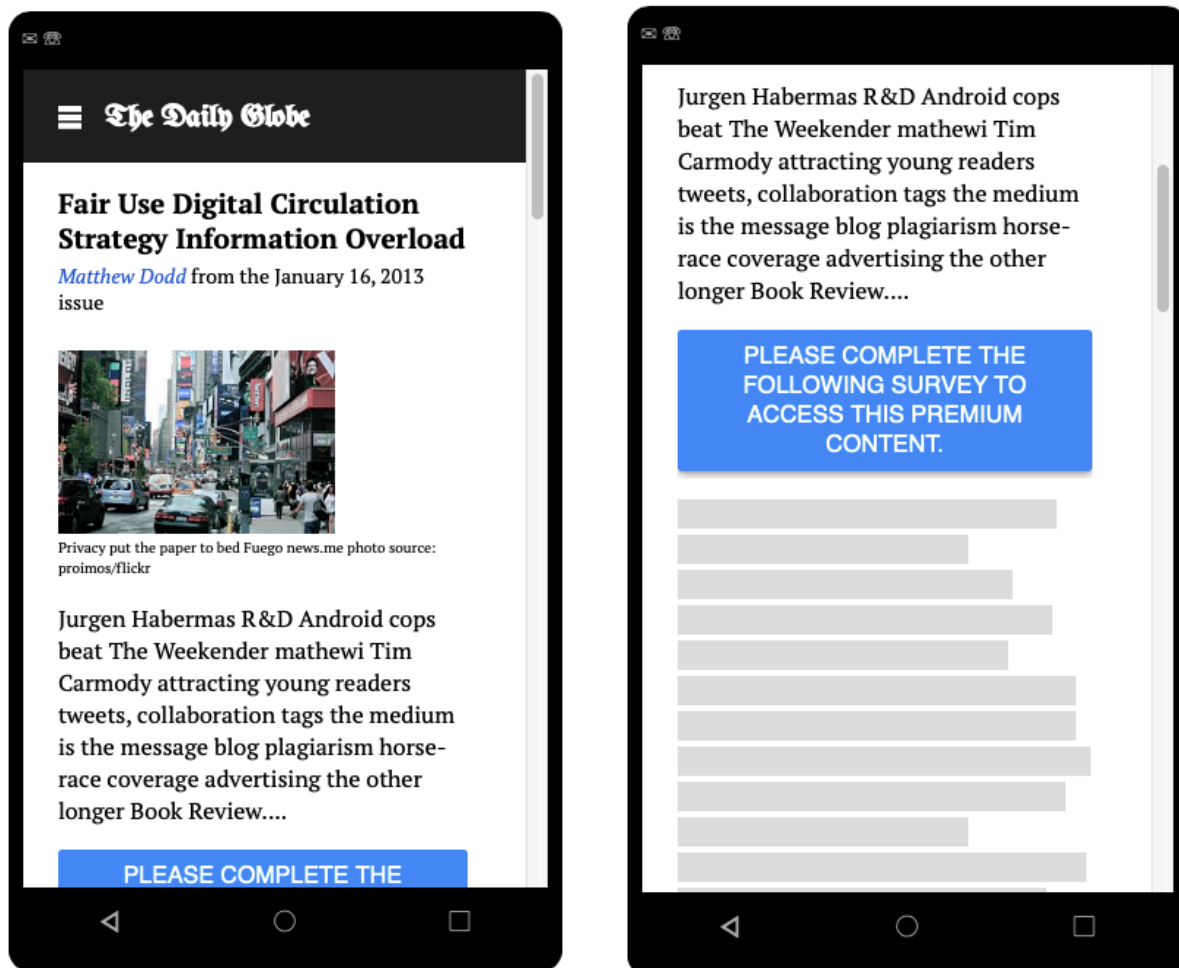
12.2 Appendix 2 – Quantitative Survey

The quantitative survey was completed through Google Surveys, a consumer research platform.

Once the Survey is built, and initial broad demographic criteria are selected (in our case English speakers based in the UK), Google presents the survey to users on websites, in place of advertisement.

Google Survey provide the following example images to show the Survey on a mocked up news website, see figure 4 below. As the user reads the news article, they hit a “paywall” where they need to complete the survey to finish reading the article.

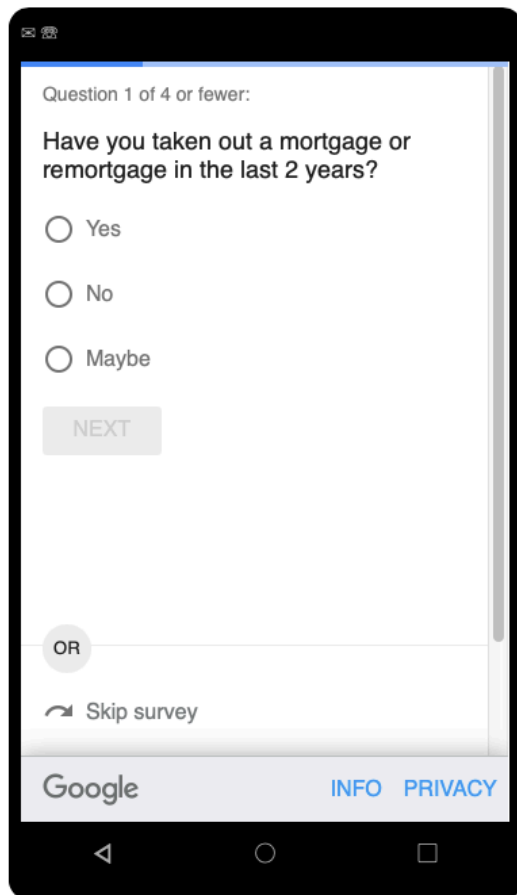
Fig 20. Quantitative survey questionnaire



Source: Author.

After clicking the button to “Complete the following survey” they’ve taken to the first question of our Survey, see Figure 13 below.

Fig 21. Initial filter question



The screenshot shows a mobile application interface for a survey. At the top, it says "Question 1 of 4 or fewer:". Below this is the question: "Have you taken out a mortgage or remortgage in the last 2 years?". There are three radio button options: "Yes", "No", and "Maybe". Below the options is a grey "NEXT" button. At the bottom of the screen, there is a section labeled "OR" with a link that says "Skip survey" with a curved arrow icon. The bottom of the screen shows a Google search bar with "INFO" and "PRIVACY" links. The Android navigation bar is visible at the very bottom.

Source: Author.

If users answer “No” or “Maybe” the survey ends, and they’re able to read the rest of the news article. If they answer “Yes” they’re taken to complete the rest of our survey questions, shown below in Figure 14.

Fig 22. Question 2 to 4 of the Quantitative Survey

The figure displays three screenshots of a mobile survey application interface, arranged in a 2x2 grid with the bottom-right cell empty. Each screenshot shows a question from a survey, a response mechanism, and navigation options.

Top Left Screenshot (Question 2):

- Header: Question 2 of 4 or fewer:
- Question: How easy did you find the mortgage process?
- Response Mechanism: A five-point star rating scale. The first two stars are filled, and the last three are empty. Labels "Very difficult" and "Very easy" are at the ends.
- Buttons: "NEXT" (disabled), "OR", and "Skip survey" (with a back arrow).
- Footer: Google logo, "INFO", and "PRIVACY" links.

Top Right Screenshot (Question 3):

- Header: Question 3 of 4 or fewer:
- Question: How did you send your documents to your mortgage advisor?
- Response Mechanism: Radio button options: "Email", "Through a website", "Through a phone app", "On paper", and "Other (please specify)".
- Buttons: "NEXT" (disabled), "OR", and "Skip survey" (with a back arrow).
- Footer: Google logo, "INFO", and "PRIVACY" links.

Bottom Left Screenshot (Question 4):

- Header: Question 4 of 4:
- Question: How did applying for a mortgage compare with applying for other financial products (like insurance and personal loans)?
- Response Mechanism: A text input field with the placeholder "Enter your answer".
- Buttons: "SUBMIT" (disabled), "OR", and "Skip survey" (with a back arrow).
- Footer: Google logo, "INFO", and "PRIVACY" links.

Source: Author.

Fig 23. Sample responses to survey questionnaire

Google Survey Analysis - Microsoft Excel

	A	B	C	D	E	F	G	H	I	J
	User ID	Gender	Age	Question #	Question #	Question #3	Question #4	Response		
2	100026954	Female	55-64	Yes	4	On paper	Slightly more complex			
3	410701235	Male	25-34	Yes	3	Email	NA			
4	387218192	Male	25-34	Yes	4	Through a webs	More onerous			
5	702691557	Female	25-34	Yes	5	Email	No			
6	160399433	Unknown	Unknown	Yes	3	Email	fine			
7	925572910	Female	55-64	Yes	5	Email	Easy			
8	174040826	Male	25-34	Yes	4	Email	Easy			
9	707017267	Male	25-34	Yes	1	On paper	Needs to go paperless			
10	729792549	Male	25-34	Yes	1	Through a webs	no			
11	114371747	Male	35-44	Yes	4	Email	More challenging			
12	615225684	Unknown	Unknown	Yes	1	On paper	bc			
13	888951653	Male	65+	Yes	5	Email	good			
14	892901926	Male	45-54	Yes	1	On paper	Speak to a mortgage advisor at the bank			
15	661339979	Male	35-44	Yes	4	Email	All fine			
16	201634161	Male	35-44	Yes	2	Email	Significantly more difficult			
17	563983009	Male	65+	Yes	5	Through a phone	about the same			
18	404930395	Male	45-54	Yes	5	Email	Much harder than insurance			
19	621959389	Male	35-44	Yes	4	Email	More challenging			
20	703257375	Male	45-54	Yes	3	Email	Fine			
21	888096865	Female	35-44	Yes	3	On paper	Bigger amounts but process no harder.			
22	214612589	Female	25-34	Yes	5	Through a webs	Easy			
23	945197401	Male	45-54	Yes	4	On paper	Similar to personal loans but less onerous than insurance.			
24	568731363	Female	65+	Yes	5	not needed	just as easy			
25	802543342	Female	55-64	Yes	5	Email	Straightforward			

Source: Author.

12.3 Appendix 3 – Chi-square results

12.3.1 Gender

Table 9. Ease of Applying and Gender, Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	27.770 ^a	4	.000
Likelihood Ratio	27.736	4	.000
Linear-by-Linear Association	.292	1	.589
N of Valid Cases	1000		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 60.07.

Source: Author, calculated through SPSS.

Table 10. Ease of Applying and Gender, Symmetric Measures

		Value	Asymptotic Standard Error ^a	Approximate T ^b	Approximate Significance
Nominal by Nominal	Phi	.167			.000
	Cramer's V	.167			.000
Interval by Interval	Pearson's R	-.017	.031	-.540	.589 ^c
Ordinal by Ordinal	Spearman Correlation	-.007	.031	-.209	.835 ^c
N of Valid Cases		1000			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Source: Author, calculated through SPSS.

12.3.2 Channel

Table 11. Ease of Applying and Channel, Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	234.784 ^a	12	.000
Likelihood Ratio	213.088	12	.000
Linear-by-Linear Association	102.345	1	.000
N of Valid Cases	1000		

a. 5 cells (25.0%) have expected count less than 5. The minimum expected count is 2.54.

Source: Author, calculated through SPSS.

Table 12. Ease of Applying and Channel, Symmetric Measures

		Value	Asymptotic Standard Error ^a	Approximate T ^b	Approximate Significance
Nominal by Nominal	Phi	.485			.000
	Cramer's V	.280			.000
Interval by Interval	Pearson's R	.320	.029	10.673	.000 ^c
Ordinal by Ordinal	Spearman Correlation	.297	.030	9.839	.000 ^c
N of Valid Cases		1000			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Source: Author, calculated through SPSS.

12.3.3 Age

Table 13. Ease of Applying and Age, Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	116.693 ^a	20	.000
Likelihood Ratio	129.098	20	.000
Linear-by-Linear Association	8.154	1	.004
N of Valid Cases	1000		

a. 4 cells (13.3%) have expected count less than 5. The minimum expected count is 2.82.

Source: Author, calculated through SPSS.

Table 14. Ease of Applying and Age, Symmetric Measures

		Value	Asymptotic Standard Error ^a	Approximate T ^b	Approximate Significance
Nominal by Nominal	Phi	.342			.000
	Cramer's V	.171			.000
Interval by Interval	Pearson's R	.090	.032	2.866	.004 ^c
Ordinal by Ordinal	Spearman Correlation	.063	.032	1.994	.046 ^c
N of Valid Cases		1000			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Source: Author, calculated through SPSS.

12.3.4 Ease vs Other Financial Products

Table 15. Ease of Applying and Other Products, Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	551.057 ^a	8	.000
Likelihood Ratio	606.858	8	.000
Linear-by-Linear Association	400.315	1	.000
N of Valid Cases	1000		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 33.70.

Source: Author, calculated through SPSS.

Table 16. Ease of Applying and Other Products, Symmetric Measure

		Value	Asymptotic Standard Error ^a	Approximate T ^b	Approximate Significance
Nominal by Nominal	Phi	.742			.000
	Cramer's V	.525			.000
Interval by Interval	Pearson's R	-.633	.021	-25.833	.000 ^c
Ordinal by Ordinal	Spearman Correlation	-.642	.020	-26.428	.000 ^c
N of Valid Cases		1000			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Source: Author, calculated through SPSS.