

A study of Industry 4.0 technologies and customer perception in the insurance industry

Mary C.B. Busschau

0708138Y

Supervisor: Dr Thomas Anning-Dorson

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ABSTRACT

The changes in society and business towards a more digitised and connected world evoke feelings of both excitement and anxiety. Businesses are increasingly using these technologies to ensure optimal customer service and delivery of services and products, but the literature shows that many customers may not be ready for this change. Industry 4.0 technologies such as big data, artificial intelligence, and the internet of things are bringing increased awareness around customer concerns on privacy, fear of autonomous robots and artificial intelligence, and a general distrust of new technology. This research study looks at the potential issues that customers have with digital technology and their perceptions of South African insurance providers using this technology. The research also looks at whether customer education and communication have an impact on these areas of privacy concerns, fear of autonomous robots and artificial intelligence and distrust of new technology and customer perception.

A quantitative research method was applied through an online survey, of which 395 participants formed the segment. Using correlation statistics and structural equation modelling the results showed that a unit increase in privacy concerns was more likely to improve their perceptions towards insurance by as much as 17.9%. The results also suggest that there is a 26% chance that improvements in trust in technologies could positively impact respondents' perceptions of insurance. The study also revealed that fear of autonomous robots and artificial intelligence have nothing to do with customer perceptions; results were not significant at the 5% level. Further results indicated that customer education and transparent communication significantly impact customer perception related to privacy concerns by 61.15% and distrust of new technologies by 143.15%. These results support most of the theories from the literature.

KEY WORDS

Industry 4.0, Customer Perception, Customer Education, Privacy Concerns, Artificial Intelligence, Big Data, Internet of Things

DECLARATION

I, Mary Busschau, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in Strategic Marketing at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Name: Mary Busschau

Signature:



Signed at Sandown, Johannesburg.....

On the 11th..... day of March..... 2021..

DEDICATION

I dedicate my research project to my partner, Buks Van Der Merwe, who has lovingly supported and motivated me throughout this research.

I also dedicate this to my family and friends who have helped me throughout the process of data collection and growing the sample size.

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LIST OF ACRONYMS

AI - Artificial intelligence

AIC - Akaike's information criterion

BIC - Bayesian information criterion

CD - Coefficient of determination

CFI - Comparative fit index

COVID-19 - 2019 Novel Coronavirus

IoT - Internet of Things

LR - Likelihood-ratio

N - Population

SD - Standard deviation

RMSEA - Root mean squared error of approximation

SEM - Structural equation model

SRMR - Standardised root mean squared residual

TLI-Tucker-Lewis index

CHAPTER 1. INTRODUCTION

1.1 Purpose of the study

This quantitative study sought to understand customer perception and how it relates to the use of digital technology in Industry 4.0 in the South African insurance industry. The purpose of this study was to understand the relationship between customer perceptions of insurance brands that use big data, artificial intelligence, and the internet of things, with a particular focus on whether privacy concerns, fear of robots and artificial intelligence, and distrust of new technology are related to this perception. It looked to understand if customer education and transparent communication have an impact on customer perception and how it relates to these areas.

1.2 Context of the study

Industry 4.0 is a term that excites businesses and those involved in technology and the use of digital mechanisms. Fletcher and Griffiths (2020) pointed out that the COVID-19 pandemic has made the digitisation of businesses even more of a priority than it already was, due to the increased need to operate a lean business model while maintaining optimum output. Digital businesses are more agile and therefore more capable of dealing with the uncertainties that today's economic troubles bring. However, for many individuals, these technologies bring with them a sense of distrust and fear for what they are truly capable of.

Cyber-physical systems such as big data, artificial intelligence, and the internet of things are seen by many as a technology that will remove the human factor from business and expel the true nature of humanity from interactions (Manyika, Chui, Miremadi, Bughin, George, Willmott, & Dewhurst, 2017). The unknown of what this technology is truly capable of places anxiety in the minds of many people, and leaves them wondering if they will still have a job in the future, if they will be able to participate in society and if they will have any true freedom and privacy in a world that is tracking them. These technologies are exciting in terms of the roles

that they can fulfil, roles that human beings have been unable to undertake at the scale that a machine learning software robot can. But, what can that robot become capable of as it learns the most logical process to achieve its objectives? Where are the privacy boundaries for human beings, and who decides where that line gets crossed? What may be comfortable for one person makes another uneasy.

This research focuses on understanding the factors of customer trust and customer perception, as well as understanding the technologies that are part of Industry 4.0 that directly impact customer relations and effective marketing and business. The issue that this research study explores is that businesses will increasingly need to encourage participation from customers by building trust in the use of new technologies. By building trust, businesses will be able to increasingly build customer relationships which will therefore build customer equity and increase business success.

The impact of the research is to assist the area of marketing and customer communications to better understand how to manage the challenges that are faced with the need to use new digital technologies to give high-quality customer experiences and customer service to retain customers while not losing them due to their fear and distrust of these same digital technologies.

Businesses need to ensure that they are progressing with the needs of their customers, but that they are also being responsible for making the decisions of what technologies to on-board and how these will impact customer relations. If there are any anxieties and concerns around these technologies, then how do businesses support customers during these changes so that their perception of the business increases in positivity?

1.3 Research problem

The literature shows that there is a general apprehension towards the use of Industry 4.0 technologies (Mantzaris & Myloni, 2018). The technologies that come up in these discussions are big data, artificial intelligence and robots, and the technologies that make up the internet of things. The collection of big data highlights the issue that people have with privacy concerns (Morey, Forbath &

Schoop, 2016) and the security of their data once it is in a business's possession (Patel, Field, & Henry, 2020). Another concern that has come through is the fear of artificial intelligence, machine learning, and autonomous robots that are understood as both hardware and software systems. This fear is around what these systems and mechanisms are truly capable of when they are programmed to learn to operate in the most efficient way possible to meet their objectives, which many view as unregulated and uncontrollable in certain contexts (Liang & Lee, 2017). A third issue is the overall distrust of the technology that forms part of Industry 4.0, due to the lack of knowledge and understanding that many have around this (Cui, 2016).

The problem is that insurance sector brands are required to use these technologies to offer better customer experience and customised products (Salesforce, 2020). If this is the requirement, but there is still a privacy concern, fear of AI capabilities, and distrust of these new technologies, then a solution needs to be studied and understood to manage positive customer perception towards these brands. There is not a clear enough understanding of whether or not this is true of the South African insurance industry, due to lack of specific academic research. Although there is literature to support the concerns and fears that customers generally have in the service industry, these have been conducted in other countries with different cultures around technology and communication. In order to understand the need for effective marketing to new and existing customers, it is important for business academics to understand the role that these technologies and the possible need for communication on them could play for businesses in this sector.

The technology acceptance model shows the relationship between ease of use of technology and the usefulness of the technology in creating efficiencies and how these are related to attitudes towards the technology through education (Davis, 1989).

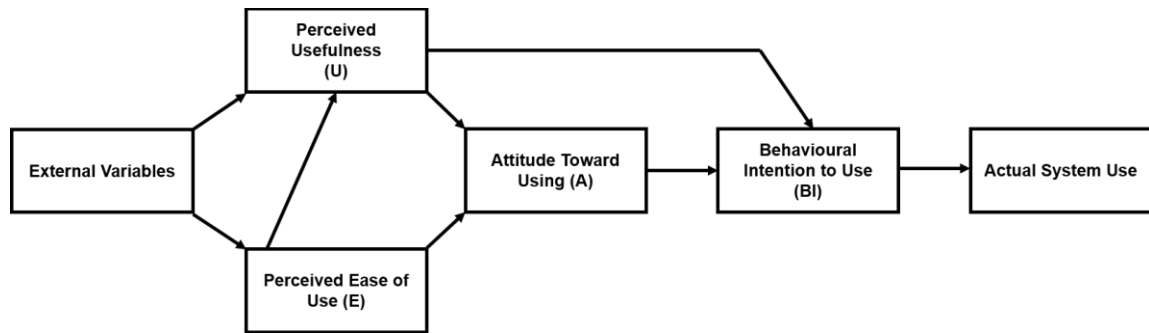


Figure 1: Technology acceptance model (Davis, 1989)

This model can be applied to this study in that understanding the attitudes towards using technologies can be related to how technologies impact customer perceptions. This is related to how customers may require some level of understanding, through communication around Industry 4.0 technologies, to alter their perception of a brand that uses these technologies. Therefore, can the concerns that are raised in the literature be impacted by a change in perception through customer education and transparent communication on the brand's use of Industry 4.0 technologies?

1.4 Research objectives

As alluded to above, there are four objectives of this research, which are:

1. To understand the extent to which privacy concerns impact customer perceptions regarding the use of big data technologies.
2. To establish the extent to which fear of autonomous robots and artificial intelligence impacts customer perceptions.
3. To ascertain whether a distrust of the use of this new technology impacts customer perceptions.
4. To assess the moderating effect of customer education and transparent communication around the use of these technologies in the relationship between privacy, fear of robots, and distrust on one hand and perception of customers on the other.

1.5 Research questions

- To what extent do privacy concerns, fear of robots and artificial intelligence, and distrust of new technology shape the perception of customers of insurance brands?
- Do brand communications in the form of customer education and transparency assuage the possible negative effect customer concerns about the use of Industry 4.0 technologies?

1.6 Significance of the study

This research study needed to be conducted due to the lack of understanding of these concerns, fears, and trust issues with Industry 4.0 technologies that the various literature reports in the South African context, and the insurance industry specifically. Insurance businesses are using these technologies to better their operations and customer experience. If there is a negative perception of their using this technology, then this relationship needs to be understood and a solution needs to be studied to maintain customer relationships.

This study is important because the use of these technologies across businesses is moving at an accelerated pace, especially in light of the COVID-19 epidemic, and businesses need to ensure that they understand what on-boarding these technologies means for their customers as well as their internal operations. Although the literature tells us that these technologies are expected by customers (Xu, David & Kim, 2018) there still needs to be a process considered in terms of customer relationship management and communication to ensure that if there truly are these perceptions towards these technologies that this does not negatively affect the brand perception and ultimately the ability for the brands to maintain their customer base.

The impact that this research could have is a better understanding of the potentially important role that customer communications play in the trust dynamic between brand, technology, and customer. The study sought to understand whether these fears and concerns exist in the insurance industry in South Africa, which has not been studied before. Some of the literature speaks to how

businesses need to look into better communications around educating customers and relationship management with regards to on-boarding these new technologies, but there is no clear study to show whether there is a relationship between communication and customer perception in this context. Having a better understanding of this could assist insurance brands, and other industries, to have a clearer idea of on-boarding processes and ensuring that operational benefits do not outweigh customer relationship requirements.

The objectives of the theory are to prove that privacy concerns, fear of autonomous robots and artificial intelligence and distrust in new technologies have an impact on customer perceptions in the South African insurance industry. The theory then moves to prove that customer education and transparent communication around the use of these technologies do improve customer's privacy concerns, fear of robots, and distrust on one hand and their perception of these brands on the other, with regards to these technologies in the South African insurance industry.

1.7 Contribution to literature

This research aids in a better understanding of the association between privacy concerns and distrust of new technologies with customer perceptions, and the impact from customer education and communication on these customer perceptions. The research will specifically assist in this understanding within the South African insurance industry, which is increasingly using these technologies, especially considering the COVID-19 pandemic and its impact on increasing usage of new technologies. Businesses may look to academic research on practical guidance around effective use on these technologies, and best practices from a communications and marketing perspective.

1.8 Delimitations of the study

This research project had some delimitations that affected the boundaries of what was possible to be studied. Firstly, only a set number of Industry 4.0 technologies and their concerns could be studied in this research. The Fourth Industrial

Revolution is comprised of several different technologies, but this research only focused on some of the primary technologies, namely big data, artificial intelligence and autonomous robots, and the internet of things. Secondly, this then allowed for only a specific set of customer concerns to be focused on in terms of privacy concerns, fear of autonomous robots, and artificial intelligence, and distrust of new technology. Finally, the study sample was kept small due to limitations in time and finances to be able to achieve a larger sample population.

1.9 Definition of terms

- Artificial intelligence - The intelligence displayed by machines and systems that are not human in nature (Yang & Siau, 2018).
- Autonomous robot - A machine or system that acts on its own without a direct command from a person (Dimitrieska, Stankovska & Efremova, 2018).
- Big data - A large amount of data that is too large for a human to process. Computers and programmes are required to be used for analysis (Lukosius & Hyman, 2018).
- COVID-19 (2019 Novel Coronavirus) - A virus pandemic that affected the world from December 2019 (Health Department, 2020).
- Customer trust - The experience that a customer has with a brand that assures them that the brand delivers on the experience that is communicated (Helbing et al., 2017).
- Customer perception - The idea and understanding of a brand that customers have based on their experience with that brand (Vera & Trujillo, 2017).
- Cyber-physical systems - The combination of the digital, physical, and biological landscapes in society in the form of aspects, such as artificial intelligence (Li, Hou & Wu, 2017).
- Industry 4.0 - The Fourth Industrial Revolution, which is comprised of physical and virtual technologies that allow for a new level of business and operations to take place (Schwab, 2016).

- Internet of Things - The use of devices and computer systems can connect through networks to communicate with and manage each other (Hudson, 2017).
- Machine Learning - A part of the deeper form of AI where a programme can have logic and prediction that it learns through interactions (Dimitrieska, Stankovska & Efremova, 2018).

1.10 Assumptions

The most important area that affects this study and is imperative for this research to be relevant is businesses' movements into Industry 4.0. Without the technologies that are in place, there would not be the concerns that customers have that could potentially affect customer perceptions. This study's relevance relies on insurance industry companies on-boarding technologies such as big data and its analysis, artificial intelligence, robots or "bots" and technologies that form part of the internet of things (connected and smart devices).

1.11 Structure of the report

Chapter 2: This chapter is the literature review where the key concepts of the study are explained through previous research and literature. The literature covers Industry 4.0 technologies, big data, artificial intelligence and autonomous robots, the internet of things, privacy concerns, customer perception and trust, and customer education and communication.

Chapter 3: The research methodology focuses on the process for planning, structuring and implementing the collection of data for this study. For the purposes of this study, it looks at a quantitative study that was conducted through an online survey and was then analysed using structural equation modelling and correlational statistics.

Chapter 4: After running the different analyses on the data, this chapter lays out the results/findings of the study. The data analysis was done using descriptive statistics, correlational statistics and structural equation modelling using STATA

statistical software. It was analysed in two sections to understand Hypotheses 1, 2 and 3 and then in a separate section to analyse the relationship for Hypothesis 4a-c.

Chapter 5: The discussion of the research and findings took each hypothesis and analysed what the data stated regarding each relationship. This was done for each of the four hypotheses and results discussed to see whether there was a significant association or not. The chapter then concludes each hypothesis for an overall conclusion based on the research objectives.

Chapter 6: This chapter looks at the final statements that are concluded for each hypothesis, with an overall summary of the findings of the research. Limitations of the study and the impact of the study were examined to state how this research can be used. Recommendations for further studies, based on the research findings, are given for future research.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

This study focused on Industry 4.0 technologies and customer perception in the insurance industry. To understand these concepts, one needs to investigate the existing literature and studies around these technologies and what constructs make up customer perception in the marketing context. The researcher explored each of the primary technologies that make up Industry 4.0; namely big data, AI, and the internet of things. They also investigated, in the literature, what customer perception and trust are, and how they are connected to marketing and communications. Finally, the researcher focused on the tactics of customer education and communication as mechanisms to manage the relationship between businesses, technologies, and customers.

2.2 Industry 4.0 technologies

The idea of change can be unsettling for any individual, but when it is on the large scale of affecting all areas of industry, business and society, there is an increased sense of unease as it affects lifestyle, careers, and wellbeing. In the case of Industry 4.0, the change may seem like a story from a science fiction novel and is far from the traditional understanding of an industry that many may have. The first industrial revolution was focused on the use of steam and mechanical machines for production. The second revolution came about due to the discovery of electricity, which enabled mass production and the division of labour to become a factor. The third revolution was the beginning of digitalization with the use of computers and automated machinery (Mantzaris & Myloni, 2018).

Society is now in the fourth industrial revolution, a time where the cyber-physical systems will be informing industry, manufacturing, and business (Li, Hou & Wu, 2017). The cyber-physical systems are a combination of the digital, physical, and biological landscapes in society in the form of aspects such as artificial intelligence, 3D printing, and genetic engineering (Li, Hou & Wu, 2017). The world is transforming in line with the needs of individuals and the available technology.

Industry 4.0, or the Fourth Industrial Revolution, is a term that was initially used in 2011 to describe the change in industry and society to a realm of connecting the virtual with the real (Li, Hou & Wu, 2017). The ideas and possibilities that were understood to only be imagined, such as creating a human heart from a 3D printer and some tissue from a skin sample, are now a reality with the use of science, technology, and the human necessity to push the boundaries.

The cyber-physical systems take programmes, digital devices and digital machinery and combine it with human ingenuity to create opportunities like real-time in-depth insights into human behaviour and machinery that can not only produce quicker than a human can, but that can also rationalise like a human can (Lee, 2008). The opportunities for growth and potential in society become infinite when one considers the issues, constraints, and challenges that are currently faced - such as global warming, disease, and overpopulation - with an impending inability to produce to meet basic needs. Wortmann and Flüchter (2015) discuss how the internet of things, for example, can assist in connecting farming machinery. The cyber-physical systems could be programmed to acknowledge the probabilities and customer needs to be based on population growth and therefore plan the farming cycles based on these predictions and trends. The machines on the farm can then be managed based on the information and their connected systems. This would allow for increased production and a greater amount of food made available efficiently for human consumption.

However, although there are clear benefits that areas such as these could see positive solutions from this interplay between the digital and physical worlds, there are those who are concerned about the effect that this technology has on lives in terms of privacy, job security, and the increasing lack of human interaction (Mantzaris & Myloni, 2018). The concerns that are raised are the primary focus of this literature review, in that the very distrust that is raised in the literature concerning the effects on lives can potentially be resolved by the very technology that people do not trust.

Marketing trends show that these technologies will have a strong presence in the fabric of all business decisions and processes moving forward to ensure that businesses are productive and efficient in delivering their objectives to customers

in the form of products and services (Kostin, 2018). If industries need to deliver higher levels of effectiveness than ever before with higher expectations from customers in terms of speed, quality, and personalisation, then these technologies need to be utilised, argue Xu, David and Kim (2018). Although customers may have possible issues with these changes, perhaps the need then is to understand exactly what these concerns are, why there is distrust of the technology, what could assist in dissipating this distrust, and then exploring what possibilities there are to use the technology to not only decrease the distrust but also to show increased opportunity for customer service excellence for effective fulfilment of all objectives through communication and education (Lee et al., 2018).

It is clear from the literature that all authors agree that technology that Industry 4.0 yields is already a reality and is positive in terms of the possibilities and the changes that it brings. However, there are challenges that Industry 4.0 technologies will bring with them in the form of inequality in the labour force, social tension and increased need for cybersecurity and regulatory bodies to ensure that ethical boundaries are maintained (Manyika, et al., 2017).

The new industrial revolution could mean that production will increase by fifty times (Xu, David & Kim, 2018), but it also means that it is predicted that at least half of all work activities will be replaced by this automated technology (Manyika, et al., 2017). Lee et al., (2018) argue that these disruptions and challenges are a reality, but they can be managed by governments and businesses through education, training and management of salaries, as well as a decrease in taxes and increased transparency from businesses. All businesses need to create plans that will manage these perceptions and concerns from customers and employees. The change to full Industry 4.0 will be quicker than previous industrial revolutions as each revolution has been quicker in fulfilment than its previous revolution. The technology itself will also ensure that this change is done at pace (Xu, Dave & Kim, 2018). Businesses need to prepare their customers and employees for this rapid movement and change. As part of Industry 4.0, education and training will need to be key factors in business development and marketing strategies moving forward. Lee et al., (2018) even argue that the realisation of Industry 4.0 will allow many individuals to reach the self-actualisation level of Maslow's Hierarchy of

Needs. At this level, one can fully realise and meet their potential (Mothersbaugh & Hawkins, 2016). So, the revolution brings with it both benefits and challenges.

Literature does show that the insurance industry is feeling increasing pressure to compete on a global scale and digitise at a fast rate, due to the increase of new operators (Cappiello, 2018). Industry 4.0 technologies are shown to have a clear effect on improved service delivery, and as the insurance industry is a service-based business this is an increasing requirement (Bohnert, Fritzsche & Gregor, 2019). Technologies such as artificial intelligence, the internet of the things and big data are playing a larger role in insurance businesses to ensure that they can compete with other firms and the needs of their customers (Cappiello, 2018).

In this case, then, it is important to outline that the factors of Industry 4.0 that will be focused on in this literature review are those that the researcher feels have the greatest effect on customer perception at this time: big data, artificial intelligence, and machine learning, and the internet of things. These are technologies that have been recognised for this research to be core to the revolution and to the distrust that customers have. These are also forms of technology that are already being used in the insurance industry at an increasing rate.

2.3 Big data

One of the primary areas of the cyber-physical systems is the accumulation and use of big data to understand mass behaviour, interests, and probabilities. Big data is a large amount of data about an individual's behaviour, interests, and tendencies that are too large for a traditional data analytics method to process and analyse (Lukosius & Hyman, 2018). The primary indicators of big data are volume (the amount of data that is collected), velocity (the speed at which data is collected and analysed), and variety (the types of data, the sources, and the richness that it yields) (Ducange, Pecori & Mezzina, 2017). There are those authors who would state that there are up to eleven overall dimensions of big data which include the three mentioned above as well as virality, vector, veracity, variability, visualisation, validity, volatility, and value (Ducange, Pecori & Mezzina,

2017). These factors all speak to the number of insights and information and the needs that big data has.

Ultimately, big data has a large amount of information within it, and businesses need to have the capacity and systems in place to access and utilise it effectively to increase market share in a competitive environment. Many businesses do have access to big data already but are unable to process and analyse it appropriately enough to use it (Morey, Forbath & Schoop, 2016). Many businesses do not have systems in place to even store this amount of data, as it needs to be stored in data centres and networks such as cloud computing (Ducange, Pecori & Mezzina, 2017).

Big data has become an important factor in all businesses, but especially in marketing practices because businesses can no longer assume or create theories about consumer behaviour and test it later, the requirement is now to research first and then create theories to ensure a clear understanding of customer's wants and needs, known as the empirical-then-theory approach (Lukosius & Hyman, 2018). Wedel and Kannan (2016) argue that marketing departments can no longer make decisions on their marketing activities without clear data to show the historical value and the future return on investment that these campaigns will yield. Businesses need to have an ignorance-based approach where they do not assume to have the answers but are now open to all possibilities that data can give (Erevelles, Fukawa & Swayne, 2016).

The insights that can be gathered through big data can allow marketing departments to have effective decision making regarding which promotion channels to use, the types of promotional messages and creatives that need to be delivered to each individual, and a deeper understanding of the personas, interests, behaviours, and needs of their existing and potential customers (Spiess, TJoens, Dragnea, Spencer & Philippart, 2014). This ensures that there is a return on investment that is within the requirements of the business and financial models. Personal data allows marketing departments to personalise customer experiences and deliver relevant information to existing and potential customers while managing budgets effectively (Patel, Field, & Henry, 2020). This data is also built into automated marketing systems for ease and efficiency.

Big data allows businesses to have a marketing advantage as they can gain a better understanding of their customers' ever-changing interests, wants, and needs through consumer analytics in industries with increased competition and a lack of differentiation between marketing messages and business offerings (Ervelles, Fukawa & Swayne, 2016). The sources of this data were through websites, but with the use of tracking through social media, devices, and new technologies organisations have access to new understandings of consumer behaviour (More, Forbath & Schoop, 2016). New digital devices allow for multiple avenues of technology to track individuals to collect data on them and their behaviour. Even social media platforms allow marketers to gather deep insights into consumer behaviour, which allows them to retarget promotional material to the correct audience as well as to predict the types of products and services that these and potential customers will be interested in for future company growth (Kerstin & Meyer, 2017).

The effective use of big data means that businesses can now have a cyclical process of gathering information, analysing it, using it to inform ideas for better decision making, and then inform the analytics system again to increase efficient analysis in the future (Ducange, Pecon & Mezzina, 2017). The analysis of "chatter" and online engagement is an organic way of assessing what consumers are interested in and how they truly feel about a product or service. This user-generated content is fed into data systems to analyse the true sentiment of customers (Tirunillai & Tellis, 2014). Chong, Ch'ng, Liu and Li, (2017) state that monitoring online reviews and promotional marketing, such as discounts and free deliveries, allows for a better understanding of customer demands and the kinds of products that they are interested in. Spiess et al., (2014) note that all this data is measured and modelled by businesses to better understand their customers to then optimise their customer experience. By delivering to the customer what they truly want, through a better customer experience, businesses can customise and move into an area where trust and loyalty are definite.

The data that is collected is so large that businesses need to use more effective ways to collect, store, and analyse it. The most important of these is the use and analysis of the data, which is why businesses are investing in artificial intelligence

programmes that can analyse the data quickly and effectively in real-time using algorithms (Kersting & Meyer, 2017). However, there are concerns around this in terms of the bias that can potentially be built into the algorithms.

The overarching issue that comes through the literature is that businesses that use big data note that customers are aware that they are being tracked, but the trust is lost when customers find out that businesses are not completely honest in what data is being collected and how it is being used (Morey, Forbath & Schoop, 2016). If data is not secure and there is a cyber-attack, a business gives access to the data to another unauthorised third party or the business themselves does not use the personal data that they ethically have access to, then this will negatively affect customer's perception of the business and ultimately have reputational damage on the brand (Culot, Fattori, Podrecca & Sartor, 2019). It is more important than ever, with businesses having increasing access to big data, for data protection and data governance to be a top priority (Dentsu Aegis Network, 2020). Businesses also have a responsibility to be transparent with customers about collecting their data, how it is stored securely, and what exactly it is used for (Patel, Field, & Henry, 2020).

Big data is an important technology in Industry 4.0, but the challenge of its collection and use makes consumers anxious and fearful (Morey, Forbath & Schoop, 2016). The “big brother” understanding of big data means that customers are increasingly aware that they are constantly being tracked but are not feeling comfortable about it. Individuals acknowledge that tracking and the collection of their data are part of living in modern society, but there is still a need to have some degree of privacy and ability to control the data that businesses have access to.

2.4 Artificial intelligence and autonomous robots

Big data is accumulated to such an extent that the volumes are too great to be processed and analysed by a traditional method. This means that smarter forms of technology need to be used to do this, and the most regularly discussed option is artificial intelligence and machine learning through autonomous robots. Artificial intelligence (AI) is a form of technology that allows a programme or machine to

perform tasks that require human intelligence (Yang & Siau, 2018). AI is comprised of weak AI, which enables basic tasks to be performed, and strong AI, which is deeper and uses a stronger sense of logic and reasoning for learning and predicting (Yang & Siau, 2018).

Machine learning is part of the deeper form of AI where a programme can have logic and prediction that it learns through interactions. An example of this is the Netflix algorithm which analyses the user's behaviour and interests and predicts or suggests what shows or movies they should watch based on this (Dimitrieska, Stankovska & Efremova, 2018). This means that AI is working hard to ensure that the customer experience is improved and customised for everyone's wants and needs in real-time. AI is therefore both simple and complicated in that it can simply and easily read, understand, and learn from the information it is given, but it is complex in how it is programmed as a system. Therefore, the trends in the labour market are for individuals with knowledge and skills to be the overall focus in terms of education and employment (Yang & Siau, 2018).

Wirth (2018) argues that intelligence is the ability to learn, have knowledge, reason, and predict or plan. However, one needs to consider elements such as emotional intelligence and the reasoning within morality and ethics, which are areas that make people so nervous about AI. Although AI is already a reality in many technologies such as Apple's Siri and Amazon's Alexa, the fear comes from two issues.

Firstly, Yang and Siau (2018) state that AI systems are already replacing people in specific jobs. The issue that people are being replaced by technology results in a psychological state of resenting that technology for taking away a survival option. The second reason is because of the possibilities for AI in the future. If AI is a technology that has infinite learning capability, then what stops it from going beyond what humans can cognitively understand and process and be ahead of the individual in multiple areas, even to the point of manipulating or controlling a person's actions (Liang & Lee, 2017). Perhaps these ideas are perpetuated by the media and science fiction content, but they are seemingly possible when leaders in technology such as Elon Musk are speaking to these dangers. In fact, in 2017 Facebook experimented with two of its AI bots. Within a few minutes, the

bots had already started to communicate in their language that they created and learned (Dasoriya, Rajpopat, Jamar & Maurya, 2018). It is this kind of media attention that creates mass hesitation and concern about the possibilities that AI holds.

Currently, AI has many limitations because it is only being used at a very basic level and has not been used to fully process understandings and activities the way the human brain can. But this brain intelligence means that machines and programmes will be able to understand, process, and act as humans do (Lu, Li, Chen, Kim & Serikawa, 2017). The difference between this brain intelligence and artificial intelligence is that a human brain can reason based both on logic and emotions, whereas AI is currently only being used within the area of logic. However, an AI system cannot become exhausted by the relentless need for this logic and learning, whereas a human brain can reach a limit in terms of capacity and what is possible especially within a short time frame (Lu et al., 2017). AI systems are already being used heavily in marketing to ensure that content is created to encourage the customer to purchase more than ever before (Kose & Sert, 2017). Machines are predicting purchasing decisions and improving customer experiences and service with the use of bots so that customer loyalty and equity are realised far more effectively (Dimitrieska, Stankovska & Efremova, 2018).

Liang and Lee (2017) explored the theory of fear of autonomous robots and artificial intelligence, which they named FARAI. Their research found that many individuals did have a fear of this technology in terms of its ability to replace humans, what it is truly capable of, and the unknown possibilities that they do not understand. A factor was also the role that media and science fiction has played in people's understanding of AI and what the possible outcomes are, which correlates with people's fear (Liang & Lee, 2017). It is important to note that robots are often not a physical machine, especially in what is so widely used in the insurance industry, but rather a software-based mechanism better known as a "bot", which automates activities based on learned algorithmic behaviours (KPMG, 2017). Pavaloiu (2016) argues that although many jobs will be replaced by AI due to the uses of automation in those areas, certain jobs such as the

services industry will always require human interaction and therefore will not be replaced. However, Makridakis (2017) states that services-based jobs will be the primary jobs to be replaced for AI programmed robots and computers. Cockburn, Henderson and Stern (2018) even go as far as stating that innovations and the invention of new products and services will no longer be a human activity and will be an AI-focused opportunity based on the speed and effectiveness that consumers and businesses require these days.

It is therefore important to investigate regulations for AI within the legal and ethical space. How far can the programmer go, and where can the line be drawn with these systems and machines? Teo (2018) argues that a clear set of laws need to be created that ensure that both the creators and users of AI systems and machinery are kept within ethical boundaries so that risks are mitigated. Although these are a definite possibility, it needs to be considered whether legal ramifications are enough to manage the fear that individuals have for this technology. Are legal procedures enough when justice is a grey area in society in general for humans?

Mcknight, Carter, Thatcher and Clay, (2011) show that in some cases, the trust of technology is not necessarily associated with the trust itself, but the humans behind the technology. With regards to AI, with its human-based tendencies, perhaps some of the trust is associated with the people behind the programming more than the technology itself.

Ultimately, the literature makes it clear that AI and autonomous robots are realities that are already intertwined in business operations and objectives (KPMG, 2017). Although they are important factors in efficiency and production there is a very apparent fear around what is truly possible within AI in terms of job replacement and the potential consideration of human replacement (Yang & Siau, 2018). These could sound like far-reaching possibilities, but to many individuals, they are a reality that is becoming a part of society much quicker than necessarily expected.

2.5 Internet of things

The internet of things (IoT) is the use of devices and computer systems that can connect through networks to communicate with and manage each other (Hudson, 2017). The IoT is already in existence, especially in first world countries in Europe and Asia, through the internet, networks, and devices. The combination of the technological and physical worlds means that there are endless opportunities and innovations for what can be created and what can be connected (Manyika, et al., 2017). An example is the farming industry where computers and systems can control the machinery used on a farm to plant the correct crop and its amounts based on probability predictions through big data analysis. The machines can then be automated to ensure that crops are then harvested automatically at precisely the correct time (Wortmann & Flüchter, 2015).

What is clear from the literature is that not only do businesses require the IoT to manage production and services more efficiently, but customers are requiring these items at an ever-increasing rate (Nagy, Oláh, Erdei, Máté & Popp, 2018). Customers appreciate the ability to connect to all their devices from a far range to automate their different appliances and digital tools such as TVs, fridges, and cell phones. The idea of being able to manage one's life by the click of a button, or an automated command from a mobile app is enticing in a world of constant movement and the need to make every day, mundane activities less of a burden.

The IoT is designed to track, locate, monitor, and identify all user activities to make an individual's life more connected and optimised for ease (Li, Hou & Wu, 2017). However, the possible concern here is that by having all of this connected technology, the individual is less liberated as they are now in a technological prison of devices that track and monitor, which is seen to lead to increased control and even manipulation (Cui, 2016). Nagy et al., (2018) also note that although the interconnectedness means more efficient forms of production it also means increased job losses to technology. Chanson, Bogner, Bilgeri, Fleisch and Wortmann (2019) argue that this technology that surrounds each human will be a considerable privacy concern due to the data that is constantly being collected to inform businesses. This data collection is not necessarily being communicated

back to individuals, and they are not in full control of it. Instead, the creators and managers of these devices and appliances will have access to data, as well as the programmers who create the systems that these devices run off. The idea that a customer could be giving someone access to all their activities purely by purchasing an item may cause distrust in that very item. However, if a business was transparent about the collection of data and what that data will be used for, perhaps the customer would be more understanding and accepting of this "invasion". Wang, Hassan, Bates and Gunter (2017) also note that the IoT also means that aspects such as smart homes are at increased risk of attack due to the ability of criminals to hack into systems to disable them or create malicious code within systems to destabilise them. Even an arsonist could create a fire in a person's home simply by programming their smart stove to blaze at a higher than normal level.

However, the fact that every action is trackable, and every programmer leaves a trace means that justice can also be an easier task for law enforcement. If a criminal or hacker performs a task that ends in a crime this can be traced back to the original creator and used as evidence if needed (Hudson, 2017). The possibility of having trackable evidence that links directly back to an individual or a programme or surveillance that records a criminal in the act of performing a crime could be the opportunities that will encourage individuals to accept this technology of connectedness and surveillance. Therefore, if these businesses can effectively communicate the clear benefit that these technologies have for the customer, they could build a better perception of them and the business.

The literature shows that the IoT is one of the biggest concerns that people have for Industry 4.0 due people have already experienced some of the corruption and security issues that can be an issue with multiple connected digital devices (Cui, 2016). This shows that what needs to be addressed is how businesses can ensure customer safety and security of not only their data but of their lives and wellbeing.

2.6 Privacy concerns

It is clear from the literature above that one of the main concerns that individuals have around Industry 4.0 technologies is that of privacy, or lack thereof, especially of their own data (Mutimukwe, Kolkowska & Grönlund, 2020). With data becoming the most valuable commodity in the world (De Franceschi & Lehmann, 2015), and a growing awareness that businesses have access to personal data and are possibly exploiting that data, individuals want to understand ways that they could control the access to and use of their personal data, especially if it is without their consent (Dhaggara, Goswami & Kumar, 2020).

Another factor is that the internet of things and the complex reliance on technology by different business operations means that businesses are also more exposed to hacking and cyber-attacks from third parties (Culot et al., 2019). These cyber-attacks would have a negative effect on brand reputation due to a loss of trust that the data that business hosts is safe and secure. Businesses need to have mechanisms in place to assure customers that their privacy policies and processes are effective and that they follow regulations for how data is stored and used (Mutimukwe, Kolkowska & Grönlund, 2020).

A lack of comfort around this will affect brand sentiment as it affects perceptions, which if negative will also affect the brand's reputation (due to a lack of trust) and likelihood of opting in and providing personal information (Mutimukwe, Kolkowska & Grönlund, 2020). An example of this is the scandal with Facebook and Cambridge Analytica, where the outcome was the loss of trust in the social media giant but also the reputational damage to both companies for their unethical conduct in accessing personal data and not having strong enough security measures in place to ensure that these incidents do not take place (Hinds, Williams & Joinson, 2020). Although Hinds et al., (2020) did observe no behavioural changes in their segment, such as deleting their social media accounts, they did note the general negative sentiment that was associated with both businesses in the aftermath.

Data is always being collected, even data that may not be needed now, but customers feel anxious about this collection and analysis as they do not have

control over its collection and use. Research has shown that customers have an expectation that companies will personalise efforts across their experience, therefore they are willing to give their data even though they are still not trusting the business's access to their data (Dentsu Aegis Network, 2020).

The Dentsu Aegis Network (2020) showed, in their research, that customers are often difficult to understand when it comes to personal data and that there are paradoxes in place between what they claim and how they practice. On one hand, they want personalisation, but on the other hand, they do not want personalised advertising. Customers demand consent, but they do not understand what they are consenting to as the majority do not read the terms and conditions that they agree to. However, what is clear is that customers continue to state that they will give their data, but if the company misuses their data or does not manage ethical standards and data governance they will no longer share their data (Patel, Field, & Henry, 2020). There needs to be transparency from businesses in terms of how data is being collected, and why. At the end of the day, the most important factor is the customer's experience, as this will allow for growth in customer loyalty, therefore online privacy and security need to be focused on to restore customer trust (Casaló, Flavián & Guinalú, 2007).

Although customers are becoming increasingly aware of this surveillance, it is the fact that data has become highly valuable. Companies are encouraged to sell the data that they have available to them, through legal means, to businesses that require specific insights into customers that they do not have access to (Morey, Forbath & Schoop, 2016). This allows for expansion into new markets and research into new designs for products and service offerings. Customers are themselves becoming open to the monetisation of data with an expectation that in the future their data will be valued on the stock market and companies will pay for access to individual's data (Dentsu Aegis Network, 2020).

2.7 Customer perception and trust

Helbing et al., (2017) argue that Industry 4.0 brings with its impending danger and loss of freedom for society. They note that leaders in technology, such as Elon Musk and Bill Gates, refer to the potential issues that this digital technology brings with it if certain mitigation plans are not put in place. The increased use of algorithms to market to customers means that individuals feel that they are making decisions by themselves, but Helbing et al., (2017) argue that this is not the case. This is seen to be a form of manipulation through persuasive marketing and surveillance capitalism (Helbing et al., 2017). To manage this issue of going against customer trust by using this technology, they suggest plans such as business transparency on the use of this technology, always ensuring that the customer is at the centre of all decisions and that the customer never be treated as an object or target, but rather as a citizen with rights that need to be protected and considered in all decisions (Helbing et al., 2017).

Luhmann's (1979) sociological theory of trust is that trust is based on the function and risk of experience. Therefore, the individual needs to have knowledge of and be familiar with the experience or object to understand its reliability and predictability for trust. A person trusts that a stove that is turned on will burn them, as they have experienced a burn from a stove before and understand that because the stove is on and hot it will burn them. Similarly, Luhmann's theory is that one learns whether something is good or bad, to be trusted or not, through experience with it.

Punyatoya (2019) notes that there are two different types of trust; cognitive trust which is based on rational reasoning and thinking, and affective trust, which is created from the use of intuition and instinctive thinking. Therefore, general trust is about logic and rationality in terms of the understanding of the effect that something can have on an individual. If trust is something that is learned through experiences, then in the case of Industry 4.0, businesses must ensure that positive experiences are at the forefront of all understandings of this technology. A case could be made for marketers creating activations and in-person opportunities to test devices and appliances that have AI and IoT built into them.

Marketers need to focus on how these devices can make customer's lives easier while also showcasing the data collection and customisation that will take place through their use.

As shown in the previous literature, the technology that is critical for Industry 4.0, and most specifically for effective business operations and marketing, leads to multiple levels of distrust. Garry and Harwood (2019) argue that trust is critical for effective marketing, as the customer needs to trust the messaging and branding that is being communicated will give them value. For the customer to trust cyber-physical systems, customers need to have a sense of familiarity with the systems, be able to predict their actions and rely on their consistency, feel confident in their own security when using this technology, and feel that there is a high level of integrity in place (Garry & Harwood, 2019).

Siau and Shen (2003) note that customers have a basic distrust of technology such as the internet and e-commerce. Such basic areas of today's society are an issue for many individuals to trust due to the inability to physically interact with something. The fact that Industry 4.0 is now asking customers to take a further step into the unknown is a risk. Dhaggara, Goswami and Kumar (2020) showed how privacy concerns and trust have a direct impact on the acceptance of new technologies. For an individual to accept a new technology they need to feel that they can trust its usefulness as well as its safety, especially in the secure storage of their personal information.

There is a level of uncertainty and possible undesirable outcomes that are associated with these Industry 4.0 technologies, which affects the trust that people have in them. However, if the technology delivers a desirable outcome then it is more likely that a person will trust it in the future (McKnight et al., 2011). This is a combination of competence-based trust (skills and knowledge) and intentional trust (honesty and integrity) that are key to building trust (Salo & Karjaluoto, 2007). This is what companies should be focused on.

Therefore, trust is a construct of psychological and sociological means that ensures that an individual feels safe (Luhmann, 1979). The individual will follow a path that ensures risk mitigation, and in the era of Industry 4.0, this means having

a full understanding of the technology that is used and what it can do (Siau & Shen, 2003). Trust is an important factor in marketing as it forms a basis for customer perception, and therefore marketers need to ensure that they are taking part in activities that increase the trust in the technologies that they and their businesses are using to increase effectiveness, customer service, and experience and customised products and services (Garry & Harwood, 2019).

2.8 Customer education and communication

The literature speaks of customer education and communication as one of the primary risk mitigation interventions that could be used with regards to the concerns and fears that are raised on Industry 4.0 Technologies (Lee et al., 2018). There is an increased need for businesses to invest more in educating customers, involve them in the product or service that is offered and have openness and increased communication with them (Bell, Auh & Eisingerich, (2017), Vera and Trujillo, (2017) and Rogers (1987)).

The previous school of thought was that by educating customers, businesses were opening them up to information that allowed them to look for alternative options in competitor businesses, and therefore decreased customer loyalty. However, research shows that educating the customer on firm-specific knowledge increases brand loyalty and opportunities for cross-selling and further products and services (Bell et al., 2017). The increase in education and liberty that customers gain to choose should only be combatted by a good customer experience, and the company's transparency and openness are critical to this. Although increased customer involvement can mean higher expectations, it is the responsibility of the company to meet those expectations to increase loyalty and brand value through satisfaction (Verage & Trujillo, 2017). By being open in communication, the business shows that they are more willing to solve problems, both internally and externally (Rogers, 1987).

An important aspect of this is ensuring that employees are also receiving open and transparent communication as well as being educated on technologies that are used. If an employee distrusts the technology then they are unlikely to use it,

which creates inefficiencies (Thielsch, Meeßen & Hertel, 2018). In some instances, there are too many technologies used by companies and this can create a gap between the strategy and the execution of that strategy, which ultimately affects the customer's experience and satisfaction (Red Point Global, 2020). Therefore, companies must focus on building trust both internally and externally with the new technologies that are used, so that they can deliver on strategies, expectations, and ultimately a good customer service and value.

Therefore, it is important to consider that communication and customer education could have a positive effect on the issues that customers may have towards Industry 4.0 technologies and the factors that come with them, such as privacy concerns, fear of autonomous robots and artificial intelligence, and distrust of these technologies. If the ultimate goal is to maintain customers and increase their loyalty, while at the same time on-boarding new technologies that ensure that these businesses are offering the most effective services and products, then it is clear that customer education and communication should be the answer.

2.9 Theoretical grounding

The theory from the literature is that privacy concerns (Casaló, Flavián & Guinalú, 2007) fear of autonomous robots and artificial intelligence (Liang and Lee, 2017) and distrust in new technologies (Mcknight, Carter, Thatcher & Clay, 2011) have an impact on the customer perceptions in the South African insurance industry. Further, the theory states that in order to manage this impact, customer education and transparent communication around the use of these technologies will improve customer's privacy concerns, fear of robots, and distrust on one hand and their perception of brands on the other, with regards to these technologies in the South African insurance industry (Bell, Auh & Eisingerich, 2017).

2.10 To what extent do privacy concerns shape the perception of customers of insurance brands?

To understand the extent to which privacy concerns impact customer perceptions regarding the use of big data technologies.

2.10.1 Privacy concerns

Morey, Forbath and Schoop (2016) argue that the primary issue regarding big data is that customers are aware that their data is being collected, but they do not know how much data is being collected or what it is used for. Industry 4.0 technologies track individual behaviour to allow for greater personalisation and a better understanding of what people are looking for and wanting. The more data points available to a large audience, the more in-depth and detailed an understanding that businesses have of customers and how best to serve them (Casaló, Flavián & Guinalú, 2007). The literature suggests that customers may want some control and communication regarding this collection and use, which would aid their perception of that business. Therefore, if businesses are going to collect data and track consumer behaviour, does this impact the customer and their perception of those businesses? Is there a definite link between the concerns that customers have around the privacy of their data and their perception of those businesses that store and use that data?

2.10.2 Hypothesis 1

Privacy concerns impact customer perceptions

2.11 To what extent does fear of autonomous robots and artificial intelligence shape the perception of customers of insurance brands?

To establish the extent to which fear of autonomous robots and artificial intelligence impacts customer perceptions.

2.11.1 Fear of autonomous robots and artificial intelligence

Liang and Lee's (2017) theory of the fear of autonomous robots and artificial intelligence (FARAI) concerning customer perception of the insurance industry was researched. The theory states that individuals are fearful of artificial intelligence and the robots and machines which have programming based on this

autonomy and machine learning. However, it is not clear outside of this study whether this fear is a real consideration, and whether businesses that use this technology would have customers who are affected by it in this manner. Is there a relationship between this fear and the perception of insurance brands that use this technology, and can it be impacted by managing customer understanding through effective communication?

2.11.2 Hypothesis 2

Fear of autonomous robots and artificial intelligence impacts customer perception.

2.12 To what extent does distrust of new technology shape the perception of customers of insurance brands?

To ascertain whether or not a distrust of the use of this new technology impacts customer perceptions.

2.12.1 Distrust of new technologies

Chanson et al., (2019) note that much of the distrust of new technology lies in the fact that customers do not know what the technology is capable of and how it is being regulated. Without this regulation and feedback to the customer, this means there is a distrust in the technology. Helbing et al., (2017) argue that these technologies are manipulating people. The technology acceptance model shows that individuals tend to distrust and reject a new technology until they experience it and have a clear understanding and knowledge of it (Davis, 1989). Could the combination of different unknown factors be culminating in a distrust of the technology that impacts the perception of a company that makes use of them? There needs to be an understanding that if the technology acceptance model is a reality, then can this distrust of new technologies affect the perceptions that customers have of the businesses that use them?

2.12.2 Hypothesis 3

Distrust of new technologies impacts customer perceptions.

2.13 Do brand communications in the form of customer education and transparency assuage the possible negative customer concerns about the use of Industry 4.0 technologies?

To assess the moderating effect of customer education and transparent communication around the use of these technologies in the relationship between privacy, fear of robots, and distrust on one hand and perception of customers on the other.

2.13.1 Educational communication and transparency

Lee et al., (2014) argue that a more positive perception around a business's use of Industry 4.0 technologies can be managed through communication around the fact that the business not only uses the technology but how it is used and what it is used for. Communication and customer education come up as a solution to the issue of customer concerns regarding these technologies. However, can a simple communications strategy be enough to impact the relationship between the three primary areas of privacy concerns, fear of autonomous robots and artificial intelligence, and distrust of new technology? Bell, Auh and Eisingerich, (2017) argue that customer education and effective communications are the most effective way of ensuring that customers increase their trust in a service provider and even become more loyal towards that brand. However, if customer education and communication do affect customer perception, can it also be the mitigating factor in its effects on the relationships between H1, H2, and H3, and can it be the action that businesses take to ultimately increase positive customer perception?

2.13.2 Hypothesis 4a-c

Customer education and transparent communication can positively impact customer perceptions and the relationship with these three concerns.

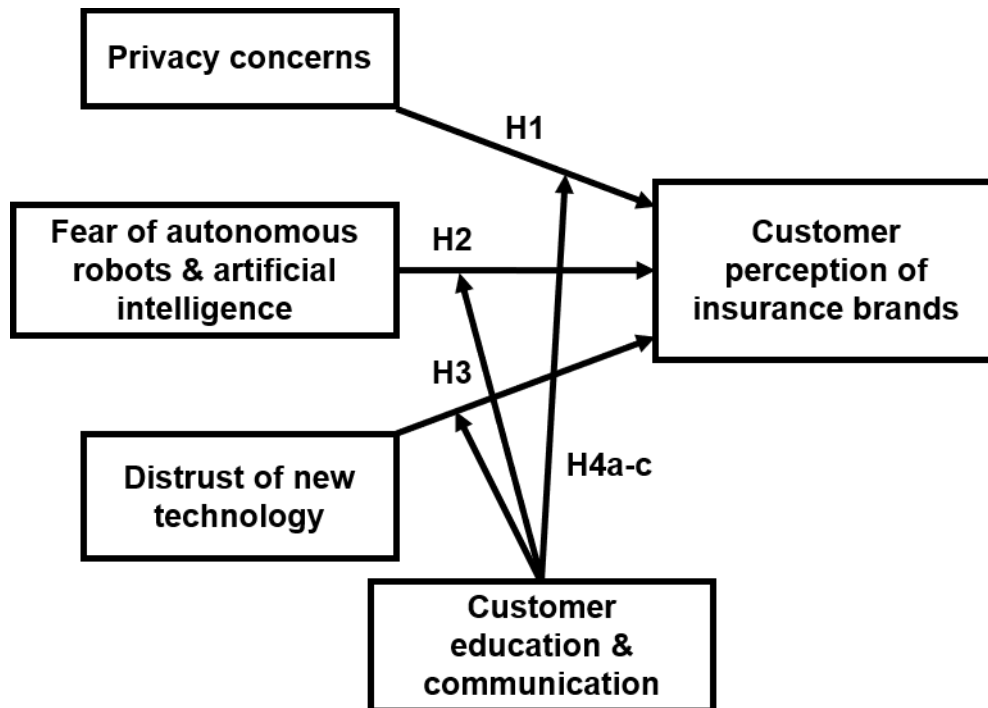


Figure 2: Hypothesised model

Figure 2 shows the relationships that were studied in this research. The literature shows that privacy concerns, fear of robots, and artificial intelligence, and distrust of new technology create apprehension. This research looks to understand if these areas impact the perception of insurance brands and whether the use of customer education and transparent communication by the brands that use this technology can impact this perception.

2.14 Conclusion of the literature review

The literature shows that there is apprehension regarding the use of Industry 4.0 technologies such as big data, artificial intelligence, autonomous robots and the internet of things (Mantzaris & Myloni, 2018). The literature also shows that customer perception and trust can be impacted by changes in a service-based business that may use new technology such as those above (McKnight et al., 2011). However, these technologies still need to be used by businesses, such as those in the insurance industry, to effectively offer customised products and services (Salesforce, 2019). If this is the case, then one hypothesises that the concerns and issues raised concerning this apprehension have a negative effect

on perceptions of the brands that use these technologies, but that if they communicated the use of this technology and were transparent about it, customers would be more accepting and this would change their perception to being more positive towards these brands; as opposed to the negative perception they would have if there was no communication or transparency.

2.14.1 Hypothesis 1: Privacy concerns impact customer perceptions

2.14.2 Hypothesis 2: Fear of autonomous robots and artificial intelligence impact customer perception

2.14.3 Hypothesis 3: Distrust of new technologies impact customer perceptions

2.14.4 Hypothesis 4a-c: Customer education and transparent communication can positively impact customer perceptions and the relationship with these three concerns

Table 1: Consistency table: research questions and hypotheses

RQ #	Research Question	Hyp. #	Literature-Based Hypothesis
1	What is your gender?	N/A	
2	What is your age?	N/A	
3	Are you? (ethnicity)	N/A	
4	Do you have insurance?	N/A	
5	What types of insurance do you have?	N/A	
6	Which company do you have insurance with?	N/A	
7	Who is your preferred insurance provider?	N/A	
8	I think my insurance company's data technologies show concern for the privacy of its users.	1	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).
9	I feel safe when I send personal information through my insurance company's online technologies.	1.2	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).

RQ #	Research Question	Hyp. #	Literature-Based Hypothesis
10	I think my insurance company abides by personal data protection laws.	1.3	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalíu, 2007).
11	I think my insurance company only collects user personal data that are necessary for its activity.	1.4	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalíu, 2007).
12	My insurance company does not send e-mail advertising without the user's consent.	1.5	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalíu, 2007).
13	I think my insurance company shows great concern for the security of any transactions.	1.6	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalíu, 2007).
14	I think my insurance company has sufficient technical capacity to ensure that the data I send will not be intercepted or modified by hackers or third parties.	1.7	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalíu, 2007).
15	Robots that can make their own decisions and take their own actions.	2.1	Fear of autonomous robots and artificial intelligence impact customer perception Liang & Lee, 2017).
16	Robots replacing people in the workforce.	2.2	Fear of autonomous robots and artificial intelligence impact customer perception Liang & Lee, 2017).
17	Artificial Intelligence.	2.3	Fear of autonomous robots and artificial intelligence impact customer perception Liang & Lee, 2017).
18	People trusting Artificial Intelligence to do work.	2.4	Fear of autonomous robots and artificial intelligence impact customer perception Liang & Lee, 2017).
19	I believe that my insurance company will employ data and online technologies in my best interest.	3.1	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).
20	If I required help, my insurance company's technological system would do its best to help me.	3.2	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).
21	My insurance company's technological system would be concerned about my well-being, not just its own.	3.3	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).
22	My insurance company's technological system would perform its role of securely storing personal information about citizens very well.	3.4	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).
23	Overall, my insurance company's technological system would be a capable and proficient means for identifying citizens.	3.5	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).
24	In general, my insurance company's technological system would have sufficient information about citizens.	3.6	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).

RQ #	Research Question	Hyp. #	Literature-Based Hypothesis
25	My insurance company's technological system is trustworthy.	3.7	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).
26	I would characterise my insurance company's technological system as honest.	3.8	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).
27	My insurance company's technological system keeps its commitments.	3.9	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).
28	My insurance company's technological system is sincere and genuine.	3.10	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).
29	I usually trust a technology until it gives me a reason not to trust it.	3.11	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).
30	I generally give a technology the benefit of the doubt when I first use it.	3.12	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).
31	My insurance company makes an effort to increase my knowledge of the products and services they offer.	4.1	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).
32	My insurance company tries to improve my skills needed to assess the pros and cons of the different services they offer.	4.2	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).
33	My insurance company takes the time to provide me with all information I need on their way of doing things.	4.3	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).
34	My insurance company gives me all the tools necessary to make informed decisions about the services I buy from them.	4.4	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).
35	My insurance company asks for suggestions and feedback.	4.5	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).
36	My insurance company listens to complaints.	4.6	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).

RQ #	Research Question	Hyp. #	Literature-Based Hypothesis
37	I like my insurance company.	1-4	Privacy concerns, fear of autonomous robots and artificial intelligence and distrust of new technology impact customer perception, and this can be impacted by customer education and communication (Vera & Trujillo, 2017).
38	Next time I need insurance, I am going to purchase from this insurance company.	1-4	Privacy concerns, fear of autonomous robots and artificial intelligence and distrust of new technology impact customer perception, and this can be impacted by customer education and communication (Vera & Trujillo, 2017).
39	I will recommend this insurance company to my friends and family.	1-4	Privacy concerns, fear of autonomous robots and artificial intelligence and distrust of new technology impact customer perception, and this can be impacted by customer education and communication (Vera & Trujillo, 2017).

CHAPTER 3. RESEARCH METHODOLOGY

To study the four hypotheses of this research, five primary constructs have been developed to test in terms of their relationships. The five constructs were developed based on the literature that showed that privacy concerns, fear of autonomous robots, and artificial intelligence, and distrust of new technology are the areas that bring the biggest issues regarding Industry 4.0 Technologies and their potential effect on customer perceptions. Therefore, the five constructs are Privacy, Fear, Distrust, Perception, and Education. These constructs mirror the model shown in Figure 2. For this research, an interpretivism philosophy was used with a deductive approach, based on the technology acceptance model theory, while using digital surveys as the data collection strategy and a mono-method choice for a cross-sectional time horizon through a digital data collection and analysis procedure.

3.1 Research philosophy

Saunders, Lewis & Thornhill (2009) display the research onion, which allows for one to understand the correct approach to take in their research to make the research credible. The model is shown in Figure 3. The first layer of the research onion is to understand the research philosophy, that is the overarching way that the world is viewed and will ultimately guide the way the research is understood (Saunders et al., 2009). There are four philosophies that one would usually use. Positivism is the traditional, empirical view of research that a scientist would take to show clear and observable relationships and causality between variables. Realism is more philosophical in nature, in understanding that objects exist outside of the human mind. Interpretivism looks at human beings as complex social actors where cause and effect are too simple to explain the nature of behaviour. Finally, pragmatism states that a theory can only be accepted if it can be proven practically (Saunders et al., 2019). In terms of this research, an interpretivism philosophy was used as the research studies humans and their feelings towards technology and how the different constructs can affect their perceptions (Saunders et al., 2009). Interpretivism does mean that the respondents' answers are subjective, but it is important to understand the

constructs in this manner as they are ultimately affected by the respondents' feelings of concern, fear, and distrust.

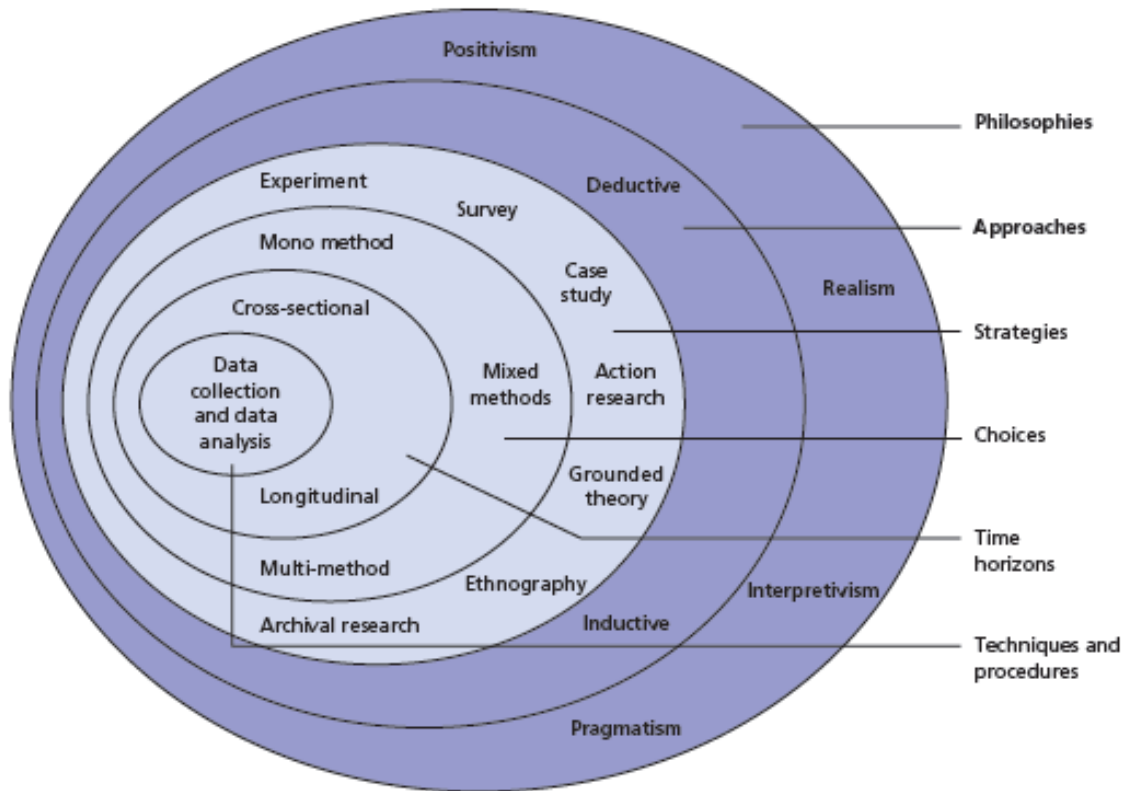


Figure 3: Research onion (Saunders, Lews & Thornhill, 2009)

3.2 Research approach

There are two different approaches to research. Deductive research is scientific in nature and explores a theoretical hypothesis to prove causality. Induction is a more open approach where there are different possibilities, and one needs to understand these in the context of the research (Saunders et al., 2009). This research used a deductive approach due to the quantitative nature of the method that was used, but also the theory that each of the hypotheses are looking to understand is now researched in the data. The data is not inferring a new theory and is looking to understand whether there is a relationship between each of the constructs in the model, or not.

3.3 Research strategy

There are several different strategies that research could take to obtain information or data for analysis. One could conduct an experiment, a case study, an ethnography, or in the case of this research, a survey. The strategy is dictated by the degree of detail required, the segment size needed to observe the variables, and the resources available to conduct the research effectively (Saunders et al., 2009). A survey was used as the strategy to conduct research due to wanting to understand whether or not there is a relationship between the constructs, but also to study this on a larger segment to better understand the perceptions that people have towards these technologies as well as the insurance brands that they have been exposed to. The use of this strategy means that the larger data can allow for relationships to be viewed between the different variables in the study.

3.4 Research method

Research methods are either mono-method, mixed-method, or multi-method depending on how many different methods are used in one study (Saunders et al., 2019). Mixed-method research would use more than one way of collecting data for the study through both quantitative and qualitative means, while multi-methods would use different data source methods but only within either qualitative or quantitative (Saunders et al., 2009). A mono-method quantitative study was done for this research because the study only calls for one method of collecting data. The quantitative surveys were based on a Likert Scale format where each question was rated on a scale of 1 to 5 and multiple choice. The questions were focused on understanding who each individual is, for demographic profiling and understanding of segment insights, and then explored a series of questions regarding individual's perceptions of insurance brands and their use of Industry 4.0 technologies, as well as understanding whether customer education and transparent communication around the use of these technologies, had an impact on customer perception. No specific insurance brands were focused on, as approval would have been required, but the insurance industry was focused on

as it uses Industry 4.0 technologies for operational and customer experience improvements.

3.5 Research time horizon

The research was cross-sectional as it was conducted from March 2020 to June 2020 only, and was concerned with the perceptions and relationships that were taking place for the segment at this specific time (Saunders et al., 20019). An important note to make about this time was that it was when South Africa was at the height of lockdown due to the COVID-19 pandemic. This meant that individuals were working from home and could have been exposed to more technology in their home environments than they would normally be exposed to. As discussed by Dentsu Aegis Network (2020) the trends show that people are using more technology due to the COVID-19 epidemic and lockdowns that took place during the period. Although it was not the objective of this study to understand COVID-19's effect on this relationship, there could potentially be some effect due to increased exposure. This exposure and effect were not researched directly.

3.6 Research techniques and procedure

The research technique and procedure look at the practical methods used for carrying out the method that is selected (Saunders et al., 20019). Techniques and procedures are selected based on the method chosen and the most logical and practical way of achieving the data required for analysis (Saunders et al., 20019). In the case of this research, the survey was distributed through digital channels such as email and social media. A Facebook page was created specifically for this research and the digital survey was shared and promoted directly from this page through targeted Facebook posts and paid media. Spend was, therefore, placed behind these posts to ensure wide dispersion and targeting to South Africans only from the ages of 18 and up. Emails were also distributed with a link to the digital survey, primarily through the University of the Witwatersrand database. The final sample size achieved was 395 completed surveys.

The sample size of 395 participants may be small, but it is representative of the population due to the distribution across a wide population of digital users. The segment is from ages 18 and over and is heterogeneous. The social media targeting, and the University of the Witwatersrand email database diversity assisted in ensuring that this was managed.

The survey was anonymous and consistent, to ensure the reliability of the data that was collected. The questions also built around each of the hypotheses constructs of Privacy, Fear, Distrust, Education, and Perception. This allowed a high degree of validity to be managed through the survey questions. The survey was first sent to the supervisor for pre-testing, as well as the Ethics Board of the University of the Witwatersrand to check for any potential issues with the questions and structure of the survey.

3.7 Population and sample

This research gathered data from a sample of 395 individuals. All the participants were based in South Africa. Petitioning research participants was managed through a social media account with geo-targeting and email communications to students at the University of the Witwatersrand. This is a mix of probability sampling and non-probability sampling to ensure that the sample size was achieved as well as a heterogeneous population. The online survey allowed for individuals of any age over 18 years old to take part, from any racial group and gender. Thus, the sample was diverse but also representative of a wider population group through its heterogeneity. The methods used also allowed for the segment to be focused on South Africans who will currently, or may have in the past, been an insurance customer. Exposure to the insurance industry in South Africa was the key descriptor for this segment. Therefore, individuals over the age of 18 years old in the South African market were asked to take part only. Whether the individual did currently have insurance was not a factor, as many individuals may have previously had insurance and since cancelled this policy. The South African population is diverse, and these methods allowed for diversity of respondents in the segment.

3.7.1 Population

Table 2: Demographics

	Variable	Frequency	Percent
Gender	Male	152	38.48
	Female	243	61.52
Age group	18 - 25 Years	64	16.20
	25 - 34 Years	169	42.78
	35 above	162	41.01
Population group	Black	174	44.05
	White	153	38.73
	Indian	35	8.86
	Coloured	13	3.29
	Other	9	2.28
	Prefer not to say	8	2.03
	Asian	3	0.76

395 respondents completed the online survey. Of the sample, six out of ten (61.5%, N=243) were female compared to 38.5% (N=152) who were male. Four out of ten (42.8%; N=169) were aged 25-34 years, 35 and above (41.0%; N=162) while fewer were aged 18-25 years (16.2%; N=64). Further results indicate that four out of ten were Black (44.1%; N=174), followed by White (38,7%; N=153). Very few were Indian (8.9%; N=35), Coloured (3.3%; N=13), Asian (0.76; N=3) and others (2.3%; N=9).

3.8 The research instrument

An online survey was created using Qualtrics. The survey was structured around 39 questions that were divided into eight sections for easy navigation of flow of the concepts being researched. The survey was structured around multiple choice and Likert-scale based questions, for ease of completion and for effective and consistent data collection. The first section focused on demographic information, to understand the sample that responded, as well as some questions regarding the insurance brands they used and the types of insurance they had. Sections two to six focused on questions regarding the three primary hypotheses. Section seven looked at researching the interaction, communication and education that

the participants receive from their insurance provider. Section eight was focused on customer perception.

3.9 Procedure for data collection

The online survey was sent as link to a number of email addresses, including a database of students from the University of the Witwatersrand who were considered old enough to have insurance based on their age and postgraduate level. A Facebook group was also created where the online survey was shared through posts and paid social media ads to geo-targeted groups. There was no incentive, but the audience was encouraged to participate in order to meet the research objectives.

3.10 Data analysis

The data analysis was conducted using both descriptive and inferential statistics, which are valid and reliable as they need to show that there is a clear relationship or significance in the statistics that are presented. The use of a stepwise approach went through the descriptive statistics, to show what the clear outcomes of the data for each question were, which was followed by correlational statistics and structural equation modelling. The data was analysed at a 95% confidence level, and a 5% margin of error.

3.11 Limitations of the study

Limitations of the study included the following:

- Possible response bias as the participants may not have been honest in their responses for various reasons.
- Participants may have selected options that were not necessarily correct in order to complete the survey as quickly as possible.
- If a participant recently had a poor or good experience with their insurance provider, unrelated to the topic being studied, this may have affected their responses to the questions.

- If a participant did not read the first section, regarding why the research was being conducted and what the various technologies were, they may have misunderstood what some technologies were in reality.

3.12 Validity and reliability

This quantitative method ensures validity as the questions and answers are based on standard responses across all participants (Saunders et al., 20019). The standard Likert Scale survey ensures that reliability is high, as the questions and responses are constructed in a manner that allows for consistency across responses for effectively testing the relationship between the independent variables of digital technologies and the dependent variable of customer perception amongst the population (Creswell, 2017). This consistency means that the survey method has high reliability. Reliability also comes from the anonymity of the survey, which ensures that participants knew that their responses would not be traced back to them and affect them. This anonymity would largely expel participant bias (Saunders et al., 20019).

To ensure that the validity of the data was as high as possible, the survey was structured based on the five constructs and measurement items that sought to understand, firstly, the perceptions that each participant had around their insurance provider, and the specific construct being analyse by each question. Validity was also tested by using structural equation modelling as part of the analysis of data, by measuring construct validity (Zumbo, 2005). Zumbo (2005) argues that validity is no longer purely based on the statistical methodologies but on a number of factors that feature in external and internal validity as different sources of evidence for this validity.

3.12.1 External validity

External validity was managed by having a larger sample size, due to the online survey method of collecting data. The online survey being shared with a wide population meant that the sample was heterogenous in nature and not selective (Saunders et al., 2009). This could have been improved on by finding methods for

obtaining a larger sample size. A further limitation is that this was focused on South African insurance brands and may not show similar results to other industries or countries.

3.12.2 *Internal validity*

Internal validity was managed by creating questions that focused on each of the variables being studied, so that a relation can be seen through data analysis. An online survey does allow for consistency or the opportunity to structure questions specifically for each variable being studied (Saunders et al., 2009). An issue may have been individuals' personal understanding of specific technologies such as robots and artificial intelligence. However, this was considered in the analysis of the data.

3.12.3 *Reliability*

The basis for the questions that were asked was found in previous literature and research that was conducted. Therefore, it would stand that the use of this online survey would produce similar results due to previous literature (Saunders et al., 20019). However, reliability was tested using the Cronbach's alpha reliability coefficient. The data was tested and found to be acceptably reliable for all the scales as the alpha coefficient was greater than 0.7. Therefore, one can state that the reliability of the results is acceptable and can give us a reliable indication of the relationship between all five variables.

3.12.4 *Objectivity*

The quantitative method that was used and the Likert-scale structure of questions meant that the results were objective and could not be based on any bias from the researcher (Saunders et al., 20019). Objectivity through the quantitative method of an online survey meant that the researcher was also removed from the responses until the data was collected.

3.13 Ethical considerations

This research had minimal ethical risks, due to the anonymous nature of the online survey and the lack of vulnerability due to the topic of the research. The upfront communication on the survey confirmed that all participant information was anonymous and confidential, and this was adhered to throughout the research project. No person information was requested of the participants. The methods for conducting the research through social media and the email database of the University of the Witwatersrand also mean that there was minimal ethical impact on participants. A research permission letter was granted by the university administration in order to access the database through their email process (Appendix E). The researcher did not have access to the database but selected the recipients of the emails via an official application form with the university.

3.14 Conclusion

The research that was conducted followed a structured approach that ensured that reliability, validity, and ethical considerations were observed throughout the process. An interpretivism philosophy was used with a deductive approach, based on the technology acceptance model theory, while using digital surveys as the data collection strategy and a mono-method choice for a cross-sectional time horizon through a digital data collection and analysis procedure. The data was analysed using descriptive statistics, correlational statistics, and structural equation modelling to interpret the results of the research and the relationship between the different variables.

Table 3: Consistency table: research questions, hypotheses, data collection and data analysis

RQ #	State Research Question	Hyp. #	Literature-Based Hypothesis	Data collection detail	Data analysis method
8	I think my insurance company's data technologies show concern for the privacy of its users.	1	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalíu, 2007).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.
9	I feel safe when I send personal information through my insurance company's online technologies.	1.2	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalíu, 2007).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.
10	I think my insurance company abides by personal data protection laws.	1.3	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalíu, 2007).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.
11	I think my insurance company only collects user personal data that are necessary for its activity.	1.4	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalíu, 2007).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.
12	My insurance company does not send e-mail advertising without the user's consent.	1.5	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalíu, 2007).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.
13	I think my insurance company shows great concern for the security of any transactions.	1.6	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalíu, 2007).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.
14	I think my insurance company has sufficient technical capacity to ensure that the data I send will not be intercepted or modified by hackers or third parties.	1.7	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalíu, 2007).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.

RQ #	State Research Question	Hyp. #	Literature-Based Hypothesis	Data collection detail	Data analysis method
15	Robots that can make their own decisions and take their own actions.	2.1	Fear of autonomous robots and artificial intelligence impact customer perception Liang & Lee, 2017).	Questionnaire Likert statement 1-5 (Not afraid to Very afraid).	SEM & Correlation Statistics.
16	Robots replacing people in the workforce.	2.2	Fear of autonomous robots and artificial intelligence impact customer perception Liang & Lee, 2017).	Questionnaire Likert statement 1-5 (Not afraid to Very afraid).	SEM & Correlation Statistics.
17	Artificial Intelligence.	2.3	Fear of autonomous robots and artificial intelligence impact customer perception Liang & Lee, 2017).	Questionnaire Likert statement 1-5 (Not afraid to Very afraid).	SEM & Correlation Statistics.
18	People trusting Artificial Intelligence to do work.	2.4	Fear of autonomous robots and artificial intelligence impact customer perception Liang & Lee, 2017).	Questionnaire Likert statement 1-5 (Not afraid to Very afraid).	SEM & Correlation Statistics.
19	I believe that my insurance company will employ data and online technologies in my best interest.	3.1	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.
20	If I required help, my insurance company's technological system would do its best to help me.	3.2	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.
21	My insurance company's technological system would be concerned about my well-being, not just its own.	3.3	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.
22	My insurance company's technological system would perform its role of securely storing personal information about citizens very well.	3.4	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.

RQ #	State Research Question	Hyp. #	Literature-Based Hypothesis	Data collection detail	Data analysis method
23	Overall, my insurance company's technological system would be a capable and proficient means for identifying citizens.	3.5	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.
24	In general, my insurance company's technological system would have sufficient information about citizens.	3.6	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.
25	My insurance company's technological system is trustworthy.	3.7	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.
26	I would characterise my insurance company's technological system as honest.	3.8	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.
27	My insurance company's technological system keeps its commitments.	3.9	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.
28	My insurance company's technological system is sincere and genuine.	3.10	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.
29	I usually trust a technology until it gives me a reason not to trust it.	3.11	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.
30	I generally give a technology the benefit of the doubt when I first use it.	3.12	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.

RQ #	State Research Question	Hyp. #	Literature-Based Hypothesis	Data collection detail	Data analysis method
31	My insurance company makes an effort to increase my knowledge of the products and services they offer.	4.1	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM.
32	My insurance company tries to improve my skills needed to assess the pros and cons of the different services they offer.	4.2	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM.
33	My insurance company takes the time to provide me with all information I need on their way of doing things.	4.3	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM.
34	My insurance company gives me all the tools necessary to make informed decisions about the services I buy from them.	4.4	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM.
35	My insurance company asks for suggestions and feedback.	4.5	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM.
36	My insurance company listens to complaints.	4.6	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM.
37	I like my insurance company.	1-4	Privacy concerns, fear of autonomous robots and artificial intelligence and distrust of new technology impact customer perception, and this can be impacted by customer education and communication (Vera & Trujillo, 2017).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.

RQ #	State Research Question	Hyp. #	Literature-Based Hypothesis	Data collection detail	Data analysis method
38	Next time I need insurance I am going to purchase from this insurance company.	1-4	Privacy concerns, fear of autonomous robots and artificial intelligence and distrust of new technology impact customer perception, and this can be impacted by customer education and communication (Vera & Trujillo, 2017).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.
39	I will recommend this insurance company to my friends and family.	1-4	Privacy concerns, fear of autonomous robots and artificial intelligence and distrust of new technology impact customer perception, and this can be impacted by customer education and communication (Vera & Trujillo, 2017).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.

CHAPTER 4. PRESENTATION OF RESULTS

4.1 Introduction

This chapter explores to what extent privacy concerns, fear of robots and artificial intelligence, and distrust of new technology shape the perception of customers of insurance brands. It provides analysis and results in a stepwise approach, starting with descriptive, followed by correlational analysis and a structural equation model. The data was analysed at a 95% confidence level, 5% margin of error as in any social science study.

4.2 Descriptive statistics

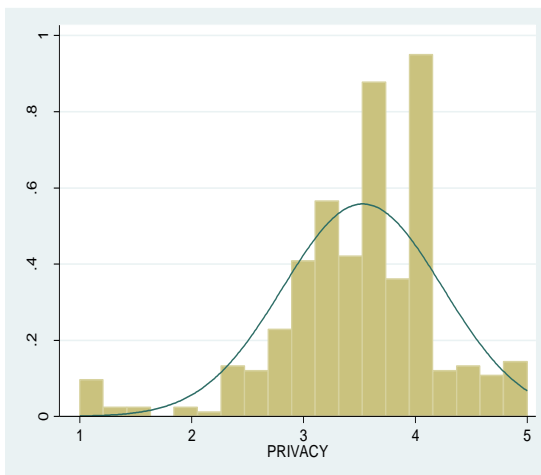


Figure 4: Privacy

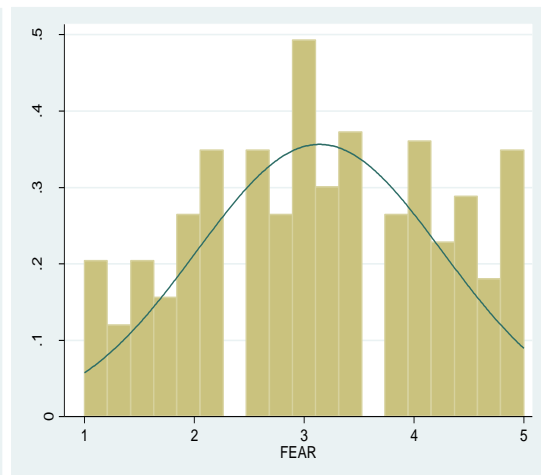


Figure 5: Fear

The mean score for the Privacy scale was 3.53 (SD=0.71) indicating weak agreement on privacy concerns impacting customer perceptions. The responses are negatively skewed as shown by Figure 4 which also shows the data was normally distributed. The mean score for the Fear scale was 3.0 (SD=1.1) indicating neutrality or uncertainty on whether they had a fear of autonomous robots and artificial intelligence. The responses are evenly distributed as shown by Figure 5 which also shows the data was normally distributed.

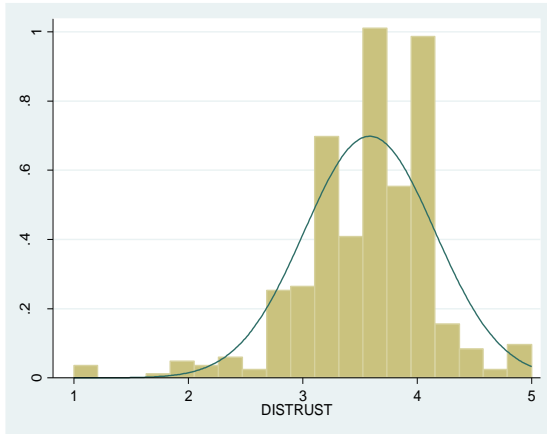


Figure 6: Distrust

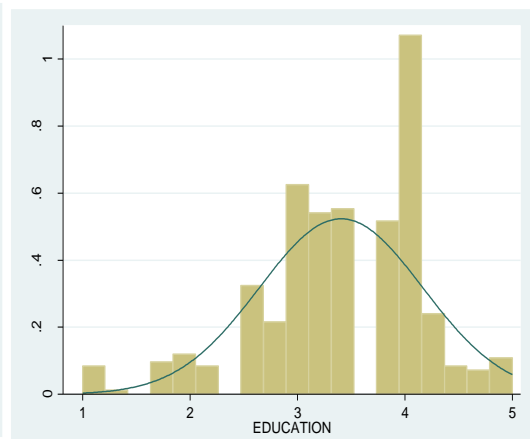


Figure 7: Customer education

The mean score for the Distrust scale was 3.7 (SD=1.1) indicating agreement on distrust of new technologies. The responses are not evenly distributed (not normally distributed) and skewed towards an agreement. The mean score for the Education scale was 3.5 (SD=1.1) indicating agreement on customer education and transparent communication. The responses are not evenly distributed (not normally distributed) and skewed towards agreement.

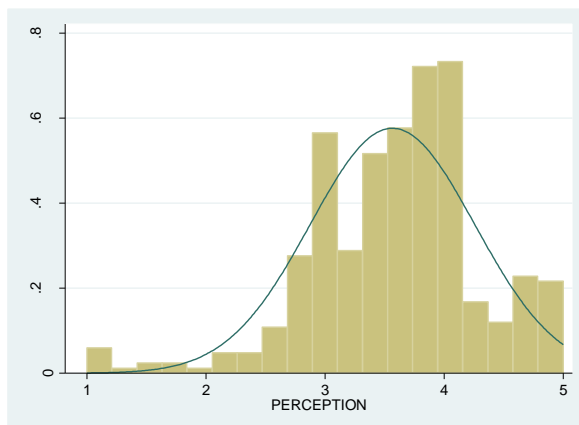


Figure 8: Customer perception

The mean score for the Perception scale was 3.6 (SD=0.69) indicating agreement on perceptions towards insurance. The responses are almost evenly distributed (normally distributed) and slightly skewed towards agreement.

In summary, respondents generally agreed to most of the aspects pertaining to privacy, distrust, and education scales. They were in doubt whether they feared AI or not (were uncertain if these impacted perceptions).

4.3 Insurance industry findings

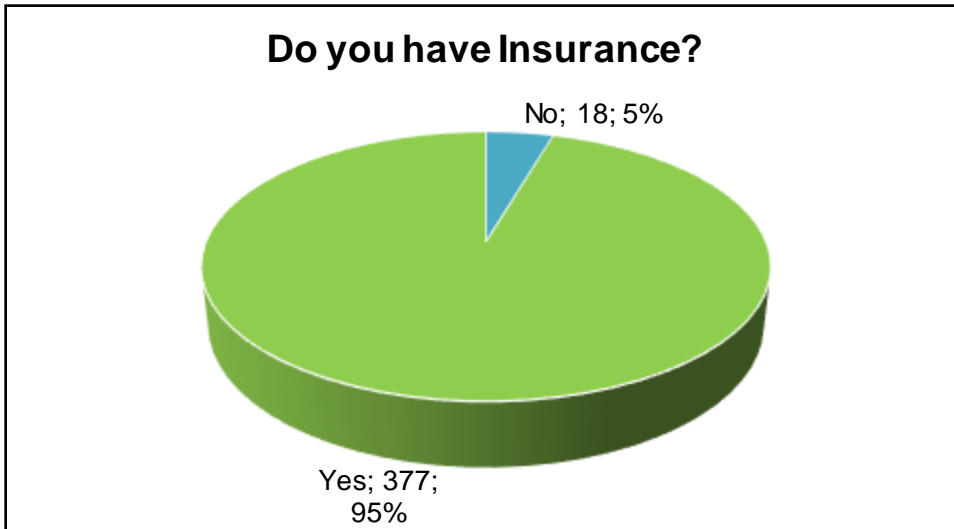


Figure 9: Insurance status

Figure 9 indicates that the vast majority of respondents (95%) had some insurance, compared to very few (5%) who did not have. The survey was not structured to exclude a participant who said “No”, as some individuals may not currently have insurance but may have previously had insurance and have since cancelled a policy. A customer perception is considered, in this case, to be based on a past, current or future customer.

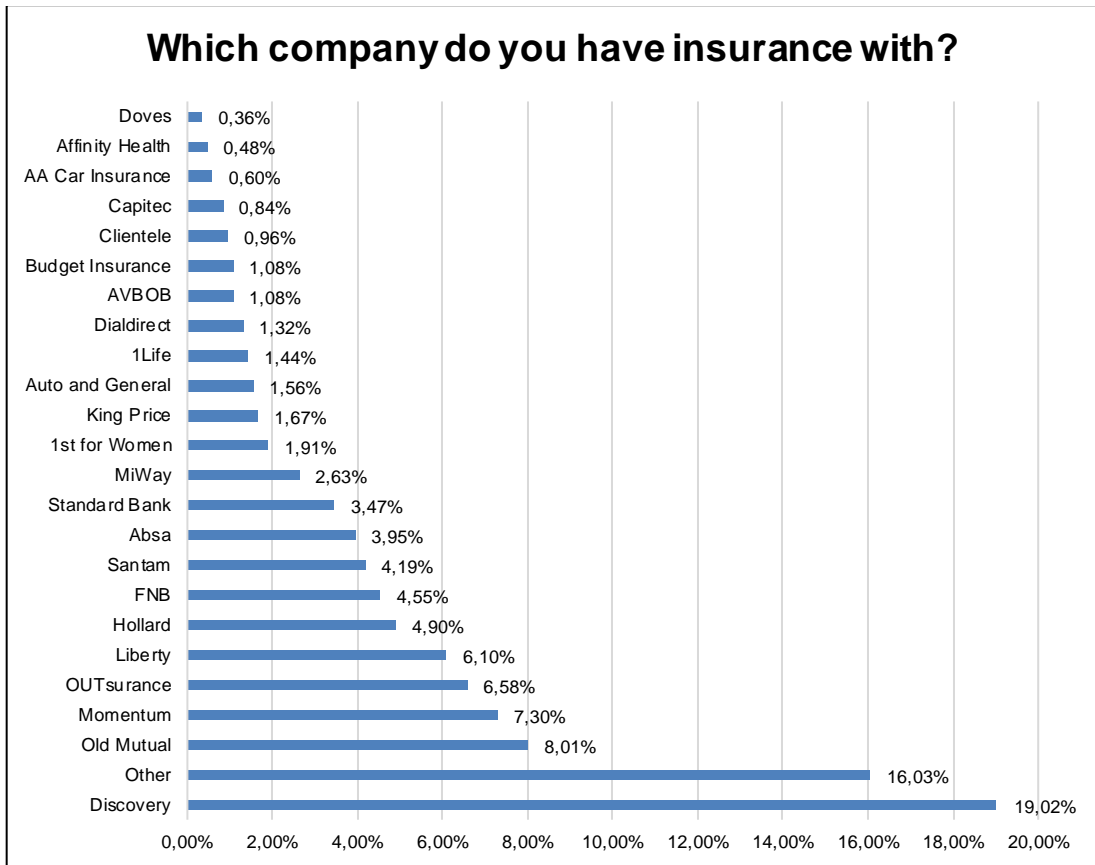


Figure 10: Insurance providers

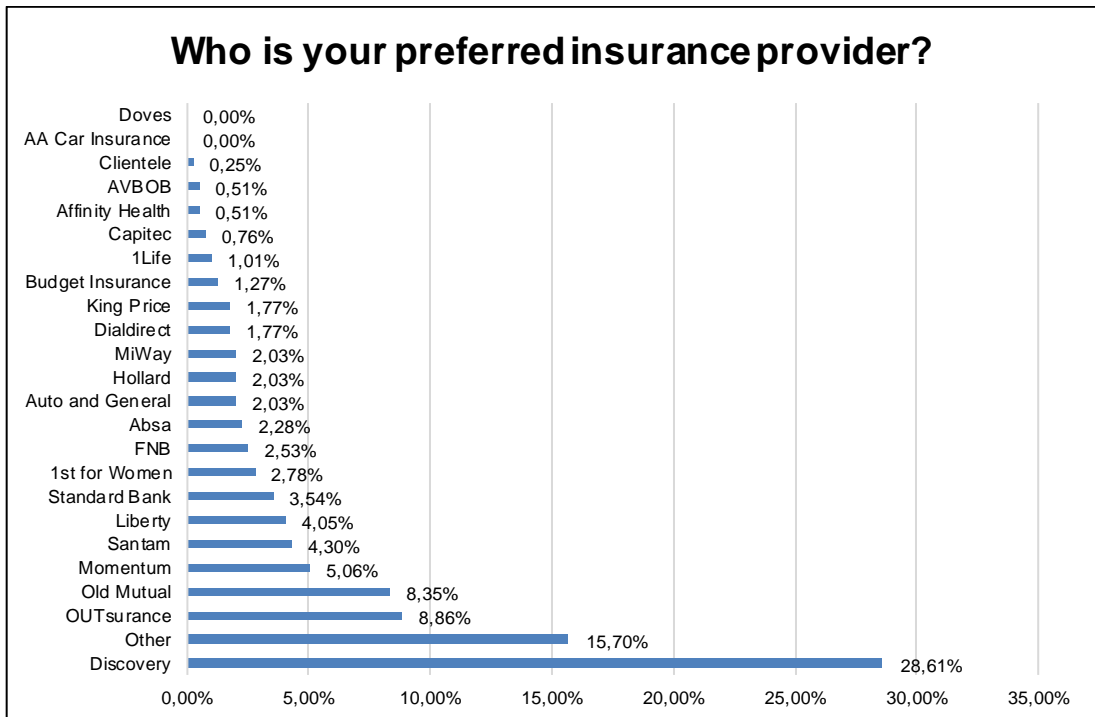


Figure 11: Preferred insurance provider

In Figure 10, participants selected more than one response as to the insurance providers they used. Discovery was selected the most (19.02%) followed by Other (16.03%).

In Figure 11, participants only selected one provider who was their preferred insurance provider. Discovery was ranked high in terms of preference (28.61%), followed by other (15.70%), OUTsurance (8.86%), Old Mutual (8.35%), and Momentum (5.06%). Both Figures 10 and 11 show that the insurance industry in South Africa is saturated

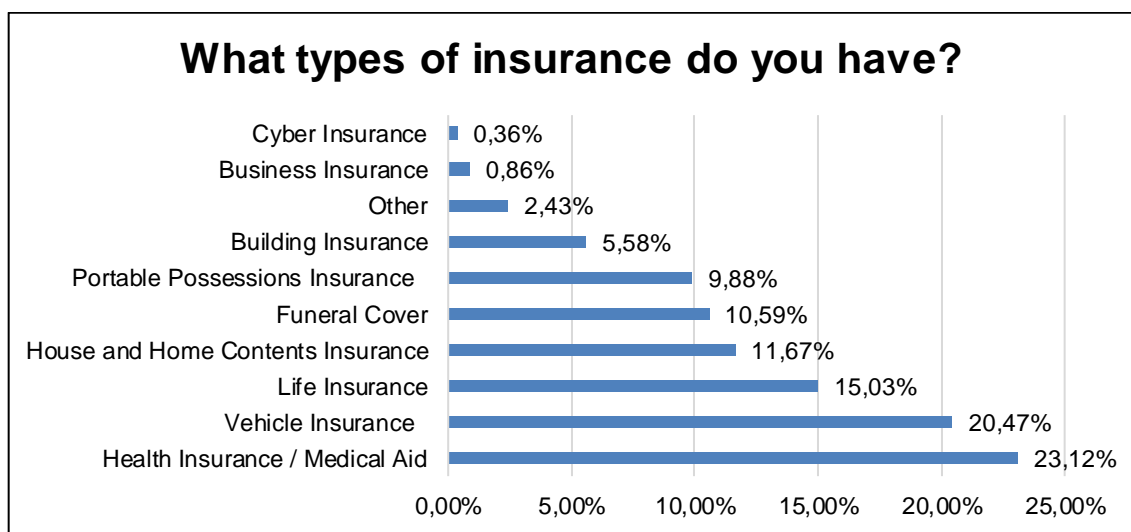


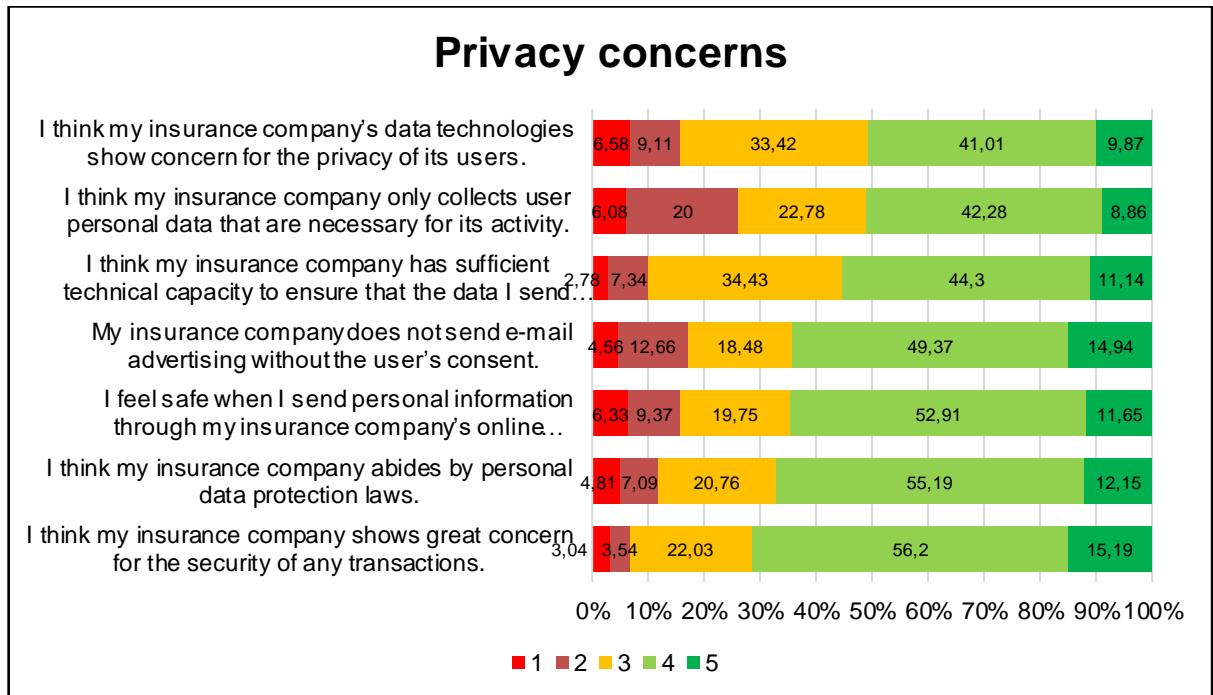
Figure 12: Types of insurance

Figure 12 supports Figures 10 and 11 by showing medical aid providers like Discovery as the most used insurance provider in the segment. The majority of the segment has medical aid/health insurance (23.12%) followed by vehicle insurance (20.47%) for cars and motorbikes.

4.4 Factors that shape the perception of insurance customers

The following section provides descriptive statistics on privacy concerns, fear of robots and artificial intelligence, and distrust of new technology as well as the perception of customers of insurance brands.

4.4.1 Privacy concerns impact customer perceptions



1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree

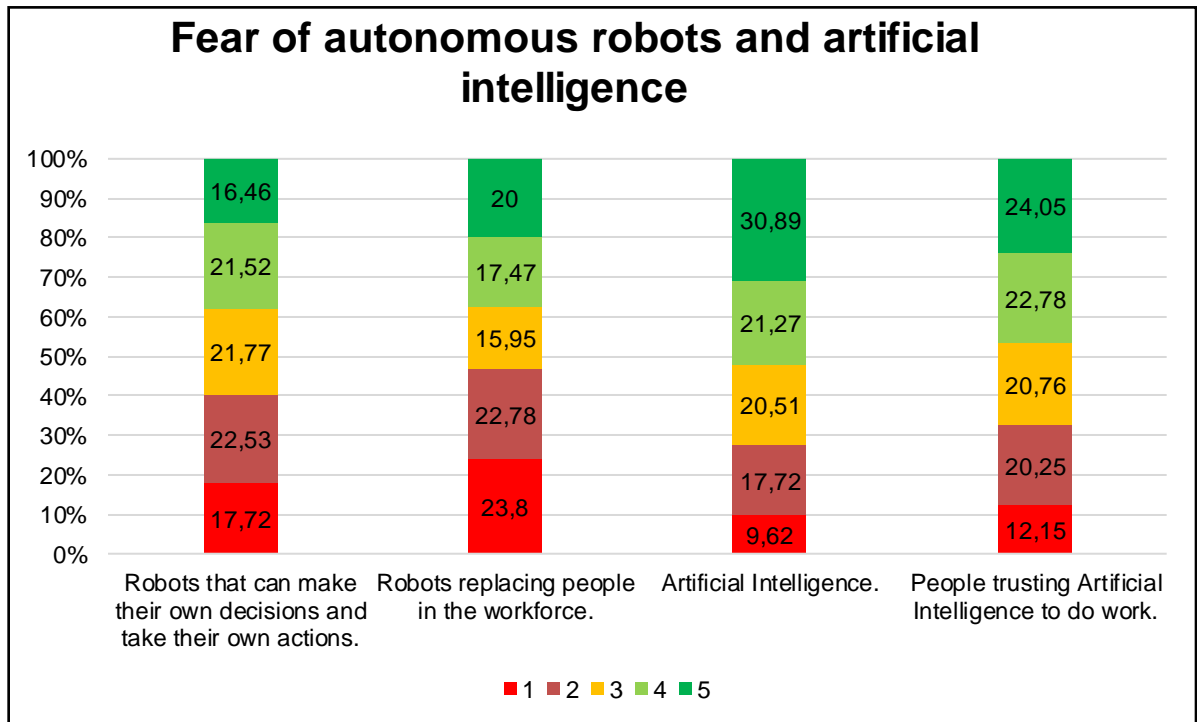
Figure 13: Privacy concerns

Figure 13 indicates that seven out of ten (71.4%) generally agreed that they think their insurance company shows great concern for the security of any transactions, a fifth (22%) of them were neutral or doubtful while very few (6.6%) disagreed to this. Two thirds (67.3%) of respondents thought that their insurance company abides by personal data protection laws, a fifth (20.8%) were in doubt, while a tenth (11.9%) disagreed with this. Six out of ten (64.6%) felt safe when they send personal information through their insurance company's online technologies, a fifth (19.8%) were neutral on this aspect, and less than 20% disagreed. Six out of 10 (64.3%) generally agreed that their insurance company does not send e-mail advertising without the user's consent. While 18.5% were in doubt about it and 17.2% of the respondents disagreed with this.

Five out of 10 (55.4%) of the respondents agreed that their insurance company has sufficient technical capacity to ensure that the data they send will not be intercepted or modified by hackers or third parties. While 34.4% were in doubt and the remaining 10.1% of them disagreed. Another five out of 10 (51.4%) agreed that their insurance company only collects user personal data that are necessary

for its activity, while 22.8% doubted that and 26.1% disagreed to it. Five out of ten respondents (50.9%) agreed that their insurance company's data technologies show concern for the privacy of its users, while 33.4% doubt it and 15.7% disagreed with it.

4.4.2 Fear of autonomous robots and artificial intelligence impacts customer perception

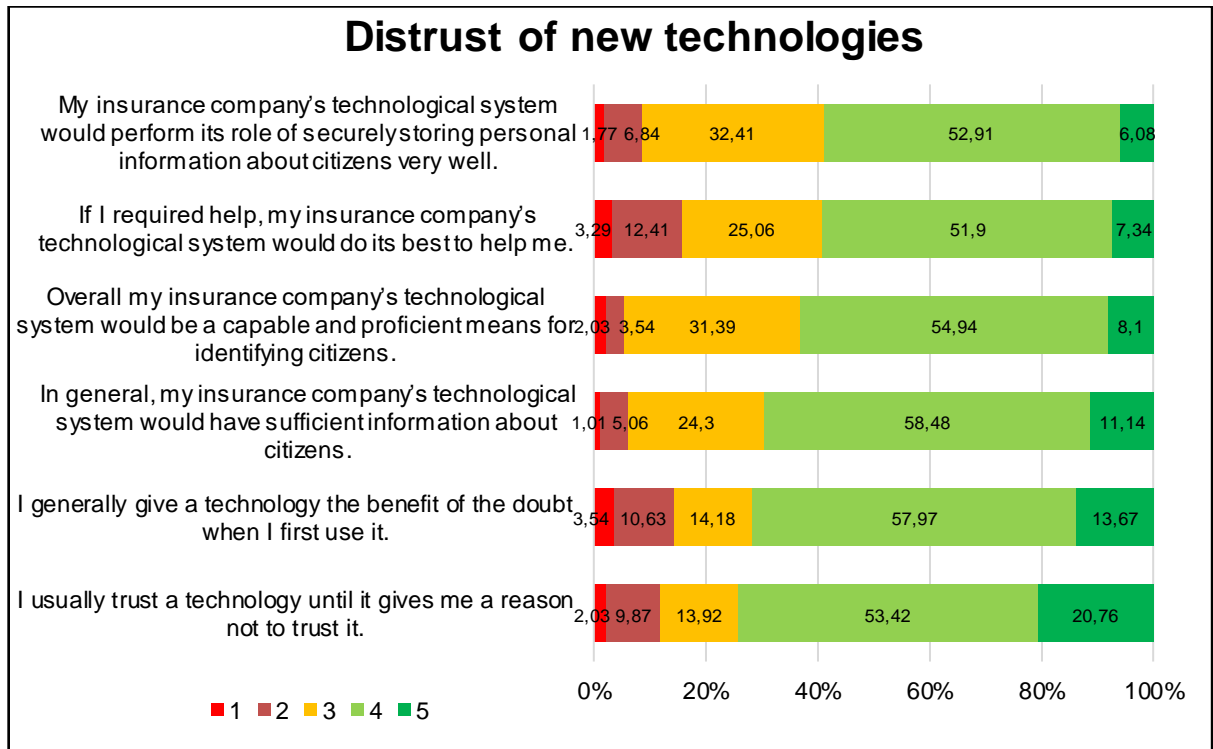


1=Not afraid 2=Slightly afraid 3=Indifferent 4=Afraid 5=Very afraid

Figure 14: Fear of autonomous robots and artificial intelligence

Half (52.2%) of the respondents indicated that they were not afraid of artificial intelligence, a quarter of them (27.3%) were afraid while less than a quarter (20.5%) were indifferent. Further results indicate that at least four out of every ten (46.8%) were not afraid of people trusting artificial intelligence to do work, almost a third (32.4%) were afraid of this, while a fifth (20.8%) were indifferent. Four out of ten (40.3%) were afraid that robots can make their own decisions and take their own actions, and 37.47% were afraid that robots can replace people in the workforce. Between three to four out of ten (37-38%) of them were not afraid that robots can make their own decisions and take their own actions and could replace them, while 15-20% were indifferent about this.

4.4.3 Distrust of new technologies impact customer perception



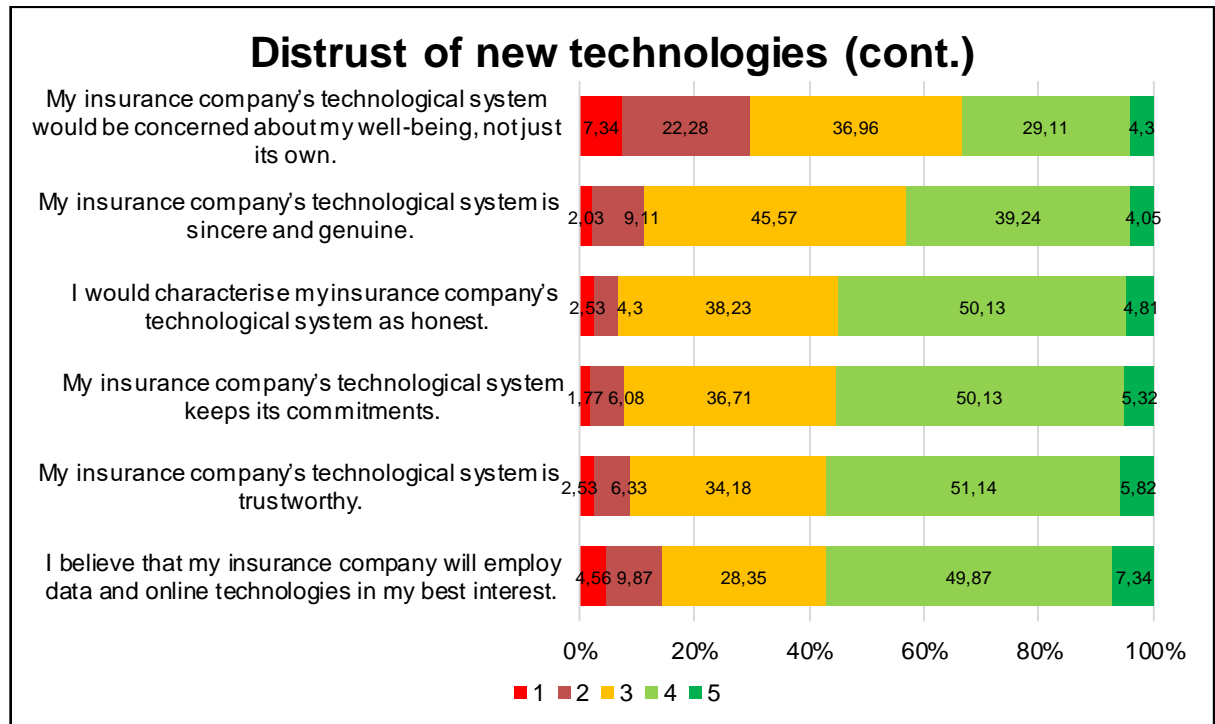
1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree

Figure 15: Distrust of new technologies 1

Seven out of 10 (74.2%) of the respondents agreed that they trust a technology until it gives them a reason not to trust it, while 13.9% were not sure and doubt it, and 19.9% disagree with it. Seven out of 10 (71.6%) of the respondents agreed that they generally give a technology the benefit of the doubt when I first use it, while 14.18% of them doubted it and 14.2% disagreed with it. Seven out of ten of the respondents (69.6%) generally agreed that their insurance company's technological system would have sufficient information about citizens, a quarter (24.3%) were in doubt, and a small number (6.1%) of them disagreed.

Six out of ten (63.04%) agreed that overall, their insurance company's technological system would be a capable and proficient means for identifying citizens. While 31.4% of them doubted it and 5.6% of them disagreed with it. Another six out of ten (59.2%) agreed that If they required help, their insurance company's technological system would do its best to help them, while 25,06% of them doubt it and 15.7% of them disagreed with it. A similar proportion-six out of ten (58.99%) of the respondents agreed that their insurance company's

technological system would perform its role of securely storing personal information about citizens very well, while 32.4% of them doubted it and 8.6% of them disagreed with it.



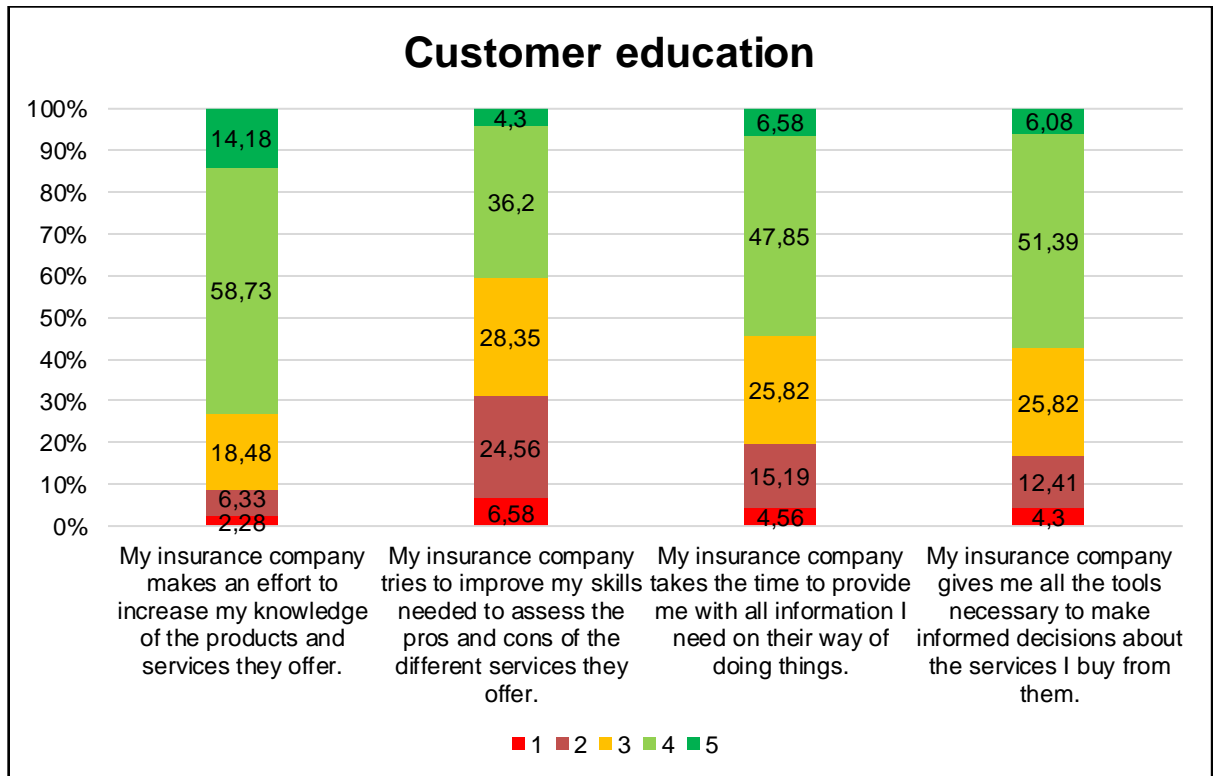
1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree

Figure 16: Distrust of new technologies 2

Five out of ten (57.2%) of the respondents generally believe that their insurance company will employ data and online technologies in their best interest, while 28.4% of them doubted it, and a smaller number (14.4%) of them disagreed with it. Another five out of ten of the respondents (57.6 %) agreed that their insurance company's technological system is trustworthy, while 34.2% of them were in doubt and 9.6% Of them disagreed. Five out of ten (55.5%) of the respondents agreed that their insurance company's technological system keeps its commitments. Over a third (36.7%) of them doubted it and 7.9% of them disagreed with it. Another five out of ten (54.9%) of the respondents agreed that they would characterise their insurance company's technological system as honest, while 38.2% of them doubted that and a small number (6.8%) of them disagreed with that. Four out of ten (43.3%) of the respondents agreed that their insurance company's technological system is sincere and genuine, while 45.6% of them doubted their insurance and 11.1% of them disagreed with it. Lastly, three out of ten (33.4%) of

the respondents agreed that their insurance company's technological system would be concerned about their well-being, not just its own, while 37.6% of them doubted it and 29.6% of them disagreed with it.

4.4.4 Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns



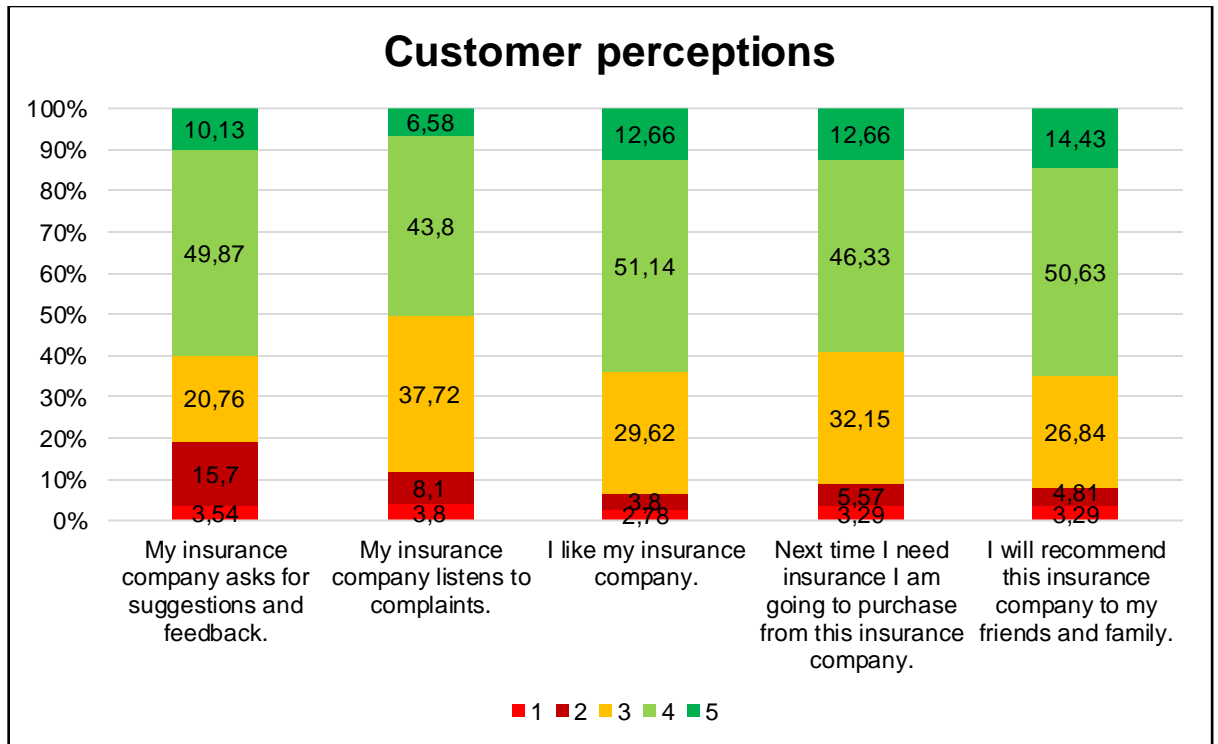
1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree

Figure 17: Customer education

Figure 17 indicates that seven out of ten (72.9%) of the respondents agreed that their insurance company makes an effort to increase their knowledge of the products and services they offer, while 18.5% of them doubt it and 8.6% of them disagreed with it. Four out of ten (40.5%) of them agreed that their insurance company tries to improve their skills needed to assess the pros and cons of the different services they offer, while 28.4% of them doubted it and 31.1% of them disagreed to it. Five out of ten (54.3%) of them felt that their insurance company takes the time to provide for them with all information they need on their way of doing things. While 25.8% of them doubted it and 19.6% of them disagreed with it. A similar proportion, 57.5% of respondents, thought that their insurance

company gives them all the tools necessary to make informed decisions about the services they buy from them. 25.8% of them doubted it and 16.7% of them disagreed with it.

4.5 Customer perceptions



1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree

Figure 18: Customer perceptions

Figure 18 indicates that six out of ten (60%) of the respondents agreed and felt that their insurance company asks for suggestions and feedback, while 20.8% of them doubted it, and 19.2% of them disagreed with it. Five out of ten (50.4%) of the respondents agreed and thought that their insurance company listens to their complaints, while 37.7% of them doubted it and 11.9% of them disagreed. Six out of ten (63.8 %) of the respondents agreed that they like their insurance company, while 29.6% of them were neutral, and 6.6% of them disagreed. Another six out of ten (60%) of the respondents agreed that next time they needed insurance they are going to purchase from this insurance company, while 32.2% of them were in doubt and 8.9% of them disagreed with it. Seven out of ten (65.06%) of respondents agreed that they will recommend this insurance company to their friends and family, while 26.8% of them doubted it, and 8.1% of them disagreed.

4.6 Reliability

Table 4: Reliability

Reliability	Test scale = mean (unstandardised items)					
			item-test	item-rest	interitem	
Item	Obs.	Sign	corr.	corr.	cov.	alpha
Privacy	395	+	0.7606	0.554	0.248997	0.7779
Fear	395	+	0.5058	0.0705	0,2365624	0.799
Distrust	395	+	0.8179	0.6945	0.242885	0.7217
Education	395	+	0.797	0.5946	0.22604	0.761
Perception	395	+	0.8055	0.6353	0.228327	0.7368
Test scale					0.236562	0.799

Cronbach's alpha reliability coefficient normally ranges between 0 and 1. The closer Cronbach's alpha coefficient is to 1.0 the greater the internal consistency of the items in the scale. Gliem and Gliem (2003) provide the following rules of thumb: “_ > .9 – Excellent, _ > .8 – Good, _ > .7 – Acceptable, _ > .6 – Questionable, _ > .5 – Poor, and _ < .5 – Unacceptable” (p. 231). Table 4 indicates that the data was reliable for all the scales as the alpha coefficient is greater than 0.7. Therefore, one can state that the reliability of the results is acceptable and can give us a reliable indication of the relationship between all five variables.

4.7 Validity

By using structural equation modelling (SEM) this research was able to test validity by providing evidence of construct validity (Zumbo, 2005). Along with further features of the method used (the use of an online survey and the breakdown of questions to understand each of the specific variables being researched) SEM is considered an appropriate testing method for validity as it combines regression analysis, path analysis, and latent variable modelling (Zumbo, 2005).

4.8 Pearson Correlation

The Pearson Correlation was used to measure the strength and direction of the linear relationship between four independent variables (Privacy, Distrust, Education, and Fear) and the perception of customers of insurance brands. The table below shows correlation coefficients which can range from -1 to +1, with -1 indicating a perfect negative correlation, +1 indicating a perfect positive correlation, and 0 indicating no correlation at all. (A variable correlated with itself will always have a correlation coefficient of 1.) (Saunders et al., 2009).

Table 5: Associations between variables

	Perceptions	Privacy	Fear	Distrust	Education	Gender	Age
Perceptions	1						
Privacy	0.4551*	1					
Fear	0.0344	0.1053*	1				
Distrust	0.5319*	0.5934*	0.162*	1			
Education	0.5661*	0.3753*	-0.084	0.5459*	1		
Gender	0.0882	0.0547	0.115*	0.0693	0.1402*	1	
Age	0.0106	0.1050*	0.168*	0.0184	-0.06	-0.0698	1
Race	-0.0336	0.0336	0.0589	-0.0207	-0.0314	0.0575	0.033

*Correlation is significant at 5% level

There was a moderately significant positive association between how privacy concerns impact customer perceptions and their perceptions on insurance (0.455; $p < 0.05$). These results suggest that a unit increase in privacy issues was likely to result in a 0.46 increase/improvement in their perceptions of insurance. There were no associations between fear of autonomous robots and artificial intelligence impacts customer perception and their perceptions on insurance results are not statistically significant at 5% level.

There were moderate associations (significant at 5% level) between distrust of new technology and its impact on customer perceptions and their perceptions on insurance (0.532; $p < 0.05$). The result suggests that there is a likelihood that a unit increase in distrust will lead to a unit increase/improvement in their perceptions of insurance. There were moderate associations (significant at 5% level) between customer education and transparent communication that can positively impact

customer perceptions and the relationship to these three concerns and respondents' perceptions of insurance. The results suggest that a unit increase in education may likely improve their perception of insurance.

Demographic factors of gender, age, and race were not associated with respondents' perceptions of insurance. Notably, age was weakly associated with privacy (0.101; $p < 0.05$) and fear (0.117; $p < 0.05$) while gender was weakly associated with customer education and transparent communication (0.140; $p < 0.05$).

4.9 Structural equation model 1

This study sought to assess to what extent privacy concerns, fear of robots and artificial intelligence, and distrust of new technology shape the perception of customers of insurance brands. To this end, structural equation modelling based on partial least squares regression was used. The following structural equation model (SEM) presents the results in the form of a pathway analysis (diagrammatically) and in table form. The data was analysed at a 95% confidence level using STATA statistical software.

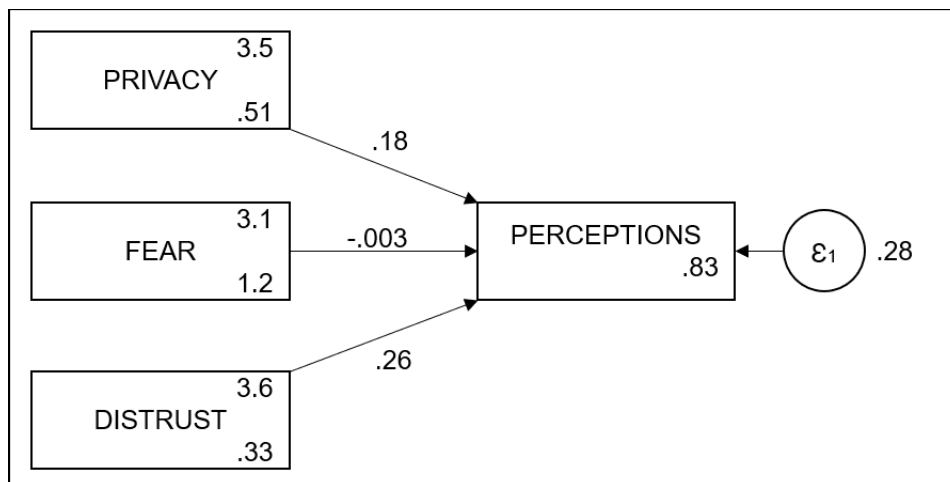


Figure 19: Pathway analysis 1

The pathway analysis is the relationship between the dependent variable (perceptions) and the independent variables (privacy, distrust, education, fear). The four arrows are unidirectional indicating the relationship is in one direction

and represent the three primary hypotheses in this study, as well as analysis of a fourth relationship between education and perception. The numbers on the arrows indicate the strength and direction of the effect of the independent variables on the dependent variable.

Table 6: Structural equation model regression 1

	Coef.	Std Err.	z	P>z	[95%	Conf. Interval]
Structural						
Perceptions	<-					
Privacy	0.179506	0.046561	3.86	0	0.088248	0.27076
Fear	-0.00301	0.024083	-0.12	0.901	-0.05021	0.04419
Distrust	0.261165	0.064588	4.04	0	0.134575	0.38776
Education	0,3438689	0,042028	8.18	0	-0,05021	0,04419
_cons	0.834712	0.18606	4.49	0	0.47004	1.199383

*LR test of model vs. saturated: $\chi^2(0) = 0.00$, Prob > χ^2
Log likelihood = -1972.1518*

Table 6 indicates that there was a positive relationship between respondents' privacy concerns and the perceptions towards insurance (B=0.179; P<0.05), results are statistically significant at the 5% level. The results suggest that a unit increase in privacy concerns was more likely to improve their perceptions towards insurance by as much as 17.9%. There was a relationship between distrust of new technologies and perceptions, results significant at a 5% level (B=0.261; P<0.05). These results suggest that there is a 26% chance that improvements in trust in technologies could positively impact respondents' perceptions of insurance. Fear of autonomous robots and artificial intelligence has nothing to do with customer perceptions, results are not significant at the 5% level.

Table 7: Model fit statistics

Fit statistic	Value		Description
Likelihood ratio			
chi2_ms(0)	0	Assess the overall fit and the discrepancy between the sample and fitted covariance matrices. H0: The model fits perfectly.	model vs. saturated
p > chi2			
chi2_bs(4)	210.67		baseline vs. saturated
p > chi2	0		
Population error			
RMSEA	0	Root mean squared error of approximation	Probability of RMSEA should be ≤ 0.05
90% CI, lower	0	0 represents a good fit.	
upper bound	0		
pclose	1	the p-value for a test of close fit	
Information criteria			
AIC	3956.3	Akaike's information criterion	Smaller values indicate a better fit.
BIC	3980.1	Bayesian information criterion	
Baseline comparison			
CFI	1	Comparative fit index	A value close to 1 indicates a good fit. $CFI \geq .90$
TLI	1	Tucker-Lewis index	
Size of residuals			
SRMR	0	Standardised root mean squared residual	Model if fit when SRMR < 0.08
CD	0.413	Coefficient of determination	

Table 7 indicates that the saturated model fits the covariances perfectly ($p < 0.00$). The RMSEA (root mean squared error of approximation) and its 90% confidence interval is less than 0.05. This statistic is a poor fit if the upper bound is above 0.10 (Browne and Cudeck, 1993). The value of the two indicates CFI (comparative fit index) and TLI (Tucker–Lewis index) is close to 1, indicating a good fit (Bentler, 1990). The SRMR (standardised root mean squared residual) points to a perfect fit as it is less than 0.08. The CD (coefficient of determination) for this model is low (0.413) which means the model is compromised and should be interpreted with caution (a perfect fit corresponds to a CD of 1). From the above table, a conclusion can be made that the model is fit since the 4 indices of RMSEA, CFI, SRMR, and Chi-square suggested by Kline (2015) indicate model fit.

4.10 Structural equation model 2

This study further sought to assess to what extent customer education and communication have on positively impacting customer perceptions and the relationship with the three independent variables of privacy, fear, and distrust, as shown in SEM 1. To this end, structural equation modelling based on partial least squares regression was used. The following structural equation model (SEM) presents the results in the form of a pathway analysis (diagrammatically) and in table form. The data was analysed at a 95% confidence level using STATA statistical software.

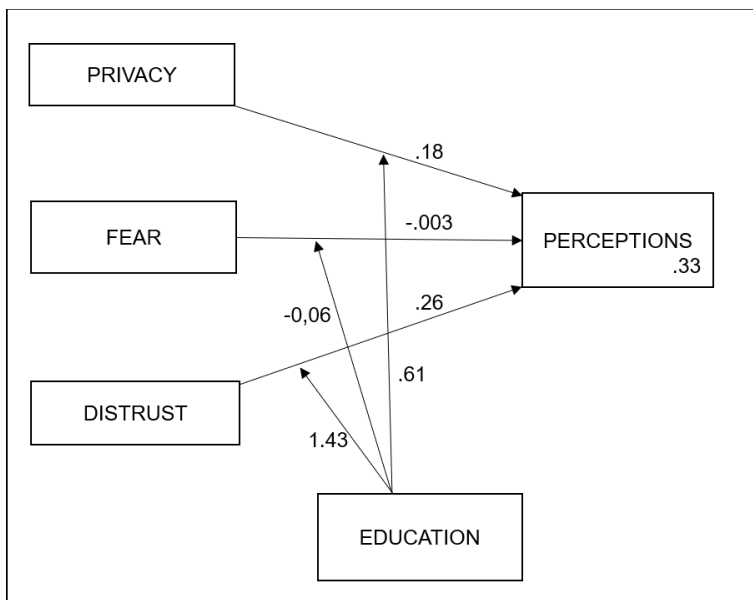


Figure 20: Pathway analysis 2

This pathway analysis is the relationship between the dependent variable (perceptions) and the independent variables (privacy, distrust, fear) with the moderator variable (education). The arrows show an impact effect from education on the three independent variables, and how this impacts the dependent variable. The numbers on the arrows indicate the strength and direction of the effect of the independent variables on perception with the effect of education. This analysis shows the fourth hypothesis and its relationship to the first three hypotheses.

Table 8: Structural equation model regression 2

	Coef.	Std Err.	z	P>z	[95%	Conf. Interval]
Structural						
Perceptions	<-					
Privacy*Education	0,611476	0,145951	4,19	0	0,325417	0,8975339
Fear*Education	-0,05691	0,075471	-0,75	0,451	-0,20483	0,0910068
Distrust*Education	1,431513	0,182672	7,84	0	1,073483	1,789543
_cons	1,121037	0,197619	5,67	0	0,733711	1,508363
var(e.Perceptions)	0,32785	0,023329	0,285171	0,376915		

*LR test of model vs. saturated: $\chi^2(0) = 0.00$, Prob > χ^2
Log likelihood = -1972.1518*

Results indicate that in the presence of education as a moderator, privacy (B=0.611; p<0.05) and distrust (B=1.431; p<0.05) had a 61.15% and 143.15% positive impact on perception. These results imply that education does have a significant impact on customer perception through its impact on privacy concerns and distrust of new technology.

Table 9: H4a-c comparison

	H1-3 Coef.	H4a-c Coef.	Change By
Structural			
Perceptions	<-		
Privacy	0.179506	0.611476	0.43197
Fear	-0.00301	-0.05691	-0.0539
Distrust	0.261165	1.431513	1.170348

Table 9 shows that when education is in place as a moderator variable, it has a significant impact and improvement on customer perceptions with regard to privacy concerns and distrust of new technologies. Customer perceptions through privacy concerns were improved by 43.2% to a significant 61.15% and distrust in new technologies were improved by 117.03% to a significant 143.15%.

4.11 Comparison of literature review and own findings

Table 10: Comparison of literature review and findings

RQ #	Research Question	Hyp. #	Literature-Based Hypothesis	Findings from Own Study
8	I think my insurance company's data technologies show concern for the privacy of its users.	1.1	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).	Privacy concerns do have a marginally significant impact on customer perceptions.
9	I feel safe when I send personal information through my insurance company's online technologies.	1.2	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).	Privacy concerns do have a marginally significant impact on customer perceptions.
10	I think my insurance company abides by personal data protection laws.	1.3	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).	Privacy concerns do have a marginally significant impact on customer perceptions.
11	I think my insurance company only collects user personal data that are necessary for its activity.	1.4	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).	Privacy concerns do have a marginally significant impact on customer perceptions.
12	My insurance company does not send e-mail advertising without the user's consent.	1.5	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).	Privacy concerns do have a marginally significant impact on customer perceptions.
13	I think my insurance company shows great concern for the security of any transactions.	1.6	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).	Privacy concerns do have a marginally significant impact on customer perceptions.
14	I think my insurance company has sufficient technical capacity to ensure that the data I send will not be intercepted or modified by hackers or third parties.	1.7	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).	Privacy concerns do have a marginally significant impact on customer perceptions.
15	Robots that can make their own decisions and take their own actions.	2.1	Fear of autonomous robots and artificial intelligence impact customer perception Liang & Lee, 2017).	Fear of autonomous robots and artificial intelligence does not impact customer perceptions.
16	Robots replacing people in the workforce.	2.2	Fear of autonomous robots and artificial intelligence impact customer perception Liang & Lee, 2017).	Fear of autonomous robots and artificial intelligence does not impact customer perceptions.
17	Artificial Intelligence.	2.3	Fear of autonomous robots and artificial intelligence impact customer perception Liang & Lee, 2017).	Fear of autonomous robots and artificial intelligence does not impact customer perceptions.
18	People trusting Artificial Intelligence to do work.	2.4	Fear of autonomous robots and artificial intelligence impact customer perception Liang & Lee, 2017).	Fear of autonomous robots and artificial intelligence does not impact customer perceptions.

RQ #	Research Question	Hyp. #	Literature-Based Hypothesis	Findings from Own Study
19	I believe that my insurance company will employ data and online technologies in my best interest.	3.1	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies does have a marginally significant impact on customer perceptions.
20	If I required help, my insurance company's technological system would do its best to help me.	3.2	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies does have a marginally significant impact on customer perceptions.
21	My insurance company's technological system would be concerned about my well-being, not just its own.	3.3	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies does have a marginally significant impact on customer perceptions.
22	My insurance company's technological system would perform its role of securely storing personal information about citizens very well.	3.4	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies does have a marginally significant impact on customer perceptions.
23	Overall, my insurance company's technological system would be a capable and proficient means for identifying citizens.	3.5	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies does have a marginally significant impact on customer perceptions.
24	In general, my insurance company's technological system would have sufficient information about citizens.	3.6	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies does have a marginally significant impact on customer perceptions.
25	My insurance company's technological system is trustworthy.	3.7	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies does have a marginally significant impact on customer perceptions.
26	I would characterise my insurance company's technological system as honest.	3.8	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies does have a marginally significant impact on customer perceptions.
27	My insurance company's technological system keeps its commitments.	3.9	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies does have a marginally significant impact on customer perceptions.
28	My insurance company's technological system is sincere and genuine.	3.10	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies does have a marginally significant impact on customer perceptions.
29	I usually trust a technology until it gives me a reason not to trust it.	3.11	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies does have a marginally significant impact on customer perceptions.

RQ #	Research Question	Hyp. #	Literature-Based Hypothesis	Findings from Own Study
30	I generally give a technology the benefit of the doubt when I first use it.	3.12	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies does have a marginally significant impact on customer perceptions.
31	My insurance company makes an effort to increase my knowledge of the products and services they offer.	4.1	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Customer education and communication does significantly impact customer perception regarding privacy concerns and distrust of new technologies.
32	My insurance company tries to improve my skills needed to assess the pros and cons of the different services they offer.	4.2	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Customer education and communication does significantly impact customer perception regarding privacy concerns and distrust of new technologies.
33	My insurance company takes the time to provide me with all information I need on their way of doing things.	4.3	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Customer education and communication does significantly impact customer perception regarding privacy concerns and distrust of new technologies.
34	My insurance company gives me all the tools necessary to make informed decisions about the services I buy from them.	4.4	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Customer education and communication does significantly impact customer perception regarding privacy concerns and distrust of new technologies.
35	My insurance company asks for suggestions and feedback.	4.5	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Customer education and communication does significantly impact customer perception regarding privacy concerns and distrust of new technologies.
36	My insurance company listens to complaints.	4.6	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Customer education and communication does significantly impact customer perception regarding privacy concerns and distrust of new technologies.
37	I like my insurance company.	1-4	Privacy concerns, fear of autonomous robots and artificial intelligence and distrust of new technology impact customer perception, and this can be impacted by customer education and communication (Vera & Trujillo, 2017).	Customer perceptions are marginally impacted by privacy concerns and distrust of new technology, and significantly impacted by customer education and communication.

RQ #	Research Question	Hyp. #	Literature-Based Hypothesis	Findings from Own Study
38	Next time I need insurance I am going to purchase from this insurance company.	1-4	Privacy concerns, fear of autonomous robots and artificial intelligence and distrust of new technology impact customer perception, and this can be impacted by customer education and communication (Vera & Trujillo, 2017).	Customer perceptions are marginally impacted by privacy concerns and distrust of new technology, and significantly impacted by customer education and communication.
39	I will recommend this insurance company to my friends and family.	1-4	Privacy concerns, fear of autonomous robots and artificial intelligence and distrust of new technology impact customer perception, and this can be impacted by customer education and communication (Vera & Trujillo, 2017).	Customer perceptions are marginally impacted by privacy concerns and distrust of new technology, and significantly impacted by customer education and communication.

CHAPTER 5. DISCUSSION OF THE RESULTS

5.1 Introduction

The primary objectives of the research were to understand to what extent privacy concerns, fear of robots and artificial intelligence, and distrust of new technology shape the perception of customers of insurance brands. And to understand if brand communications in the form of customer education and transparency assuage the possible negative effect of customer concerns about the use of Industry 4.0 technologies. To this end, the following research objectives were focused on:

1. To understand the extent to which privacy concerns impact customer perceptions regarding the use of big data technologies.
2. To establish the extent to which fear of autonomous robots and artificial intelligence impacts customer perceptions.
3. To ascertain whether a distrust of the use of this new technology impacts customer perceptions.
4. To assess the moderating effect of customer education and transparent communication around the use of these technologies in the relationship between privacy, fear of robots, and distrust on one hand and perception of customers on the other.

All objectives were assessed through the research and were met. The research gave an understanding of the moderately significant extent to which privacy concerns impacted customer perceptions, the extent to which fear of autonomous robots and artificial intelligence does not impact customer perception and the ability to understanding that distrust of the use of the new technology does have a significant impact on customer perceptions. The research was also able to show that there is a clear moderating effect of customer education and transparent communication around these technologies on the relationship between the variables and on customer perception.

Correlation statistics and structural equation modelling were used to analyse the data from 395 participants in the online survey that focused on the constructs of Privacy, Fear, Distrust, Education, and whether they affect Perceptions. The alpha coefficient of all variables in the research is greater than 0.7 (acceptable), therefore one can cautiously interpret the results based on the relationship between the variables.

5.2 Discussion pertaining to Hypothesis 1

H1: Privacy concerns impact customer perceptions

The results suggest that a unit increase in privacy concerns was more likely to improve their perceptions towards insurance by as much as 17.9% ($P < 0.05$), hence the null hypothesis is rejected. There was also a moderate significance in the relationship between privacy concerns and customer perception of 0.455 ($p < 0.05$), which supports the above statement that therefore the hypothesis stands that privacy concerns do have an impact on customer perceptions. Although this is a moderate significance, and therefore is more of an association than a direct impact, one can see that there is a relationship between these two variables. Therefore, if the on-boarding of new technologies impacts privacy concerns then it will impact the perception that customers have of that insurance brand.

Mutimukwe, Kolkowska and Grönlund (2020) researched concerns around privacy in the e-services industry and found that not only are privacy concerns present in industries that use new technologies and have access to large amounts of data, but these concerns increase when the organisations do not manage data and their use of technologies correctly. This theory is generally supported by this research, in that the results show that privacy concerns a significant concern for the segment. This also shows in Hypothesis 4a-c where we can see that when use of data and new technologies is communicated to customers there is an improvement in the concerns around this privacy and their effect on customer perceptions. Casaló, Flavián and Guinalú (2007) also showed that this affects the customer's experience, which we understand has a direct impact on customer

loyalty and trust. This is supported by the research in that there is a moderately significant impact from privacy concerns on customer perceptions.

5.3 Discussion pertaining to Hypothesis 2

H2: Fear of autonomous robots and artificial intelligence impacts customer perception

Fear of autonomous robots and artificial intelligence has nothing to do with customer perceptions, as results are not significant at the 5% level, hence the null hypothesis is not rejected. The relationship was the lowest at 0.034 ($p < 0.05$), which tells us that fear of autonomous robots and artificial intelligence does not have an impact on customer perception. Although this may be a hypothesis that holds in other contexts, it is not true of this segment of 395 South African insurance customers.

Liang and Lee (2017) theorised that there is a fear of autonomous robots and artificial intelligence in society, primarily due to misunderstandings of these technologies through media. However, this theory does not necessarily hold in the case of this research. The results clearly show that this fear and concern is not represented in this segment.

5.4 Discussion pertaining to Hypothesis 3

H3: Distrust of new technologies impact customer perceptions

The results suggest that there are 26% ($P < 0.05$) of chances that distrust in technology could positively impact respondents' perceptions of insurance, hence the null hypothesis is rejected. The relationship was relatively strong at 0.531 ($p < 0.05$) compared with privacy concerns. This is evidence to conclude that there is a moderately significant association between distrust of new technology and its impact on customer perceptions. This is in line with the technology acceptance model, which also showed that the trust of new technologies is an important factor that businesses need to be focused on when onboarding these new technologies.

Helbing, et al., (2017) theorise that people have a deep distrust in the new technologies in Industry 4.0 due to the manipulation opportunities that they create for the businesses that use them, and the risks that are associated with them in terms of a lack of control and loss of a human being as a central figure anymore. Although these specific details were not researched, the theory that people have a distrust of new technologies is supported by the research to a significant degree. Luhmann's (1979) theory of trust, in conjunction with Davis's (1989) technology acceptance model, shows that people will have a distrust of new technologies because they have either had a poor experience with it before or because they do not understand it. If we hold Vera and Trujillo's (2017) understanding of customer perception to be true, that it is the idea and understanding of a brand that customers have based on their experience with that brand, then we understand that trust and customer perception are connected through a customer's experience.

5.5 Discussion pertaining to Hypothesis 4a-c

H4a-c: Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns

The results show that there was a significant impact on improved customer perception when customer education and communication were in place as a moderator on privacy concerns and distrust of new technology. Results show that customer perceptions impacted by privacy concerns improved by 43.20% to a significant 61.15%, and customer perceptions impacted by distrust in new technologies were improved by 117.03% to a significant 143.15%. Due to fear of autonomous robots and artificial intelligence having no impact on customer perception, this was not improved by customer education and communication. Therefore, we can conclude that customer education and transparent communication does have a significant impact on customer perceptions in its relationship to privacy concerns and distrust of new technologies.

Lee et al., (2018) suggested that education and communication were a possible risk mitigation tactic that businesses should consider using in light of the concerns

and fears regarding Industry 4.0 technologies. This was only a suggestion and was not researched in their report, but the theory from Bell et al., (2017) that communication and education not only impact customer perceptions but also customer loyalty is significantly supported by this research. The original thought was that educating customers leads them to investigate alternatives (Bell et al., 2017) however, this idea has been proven incorrect by different research including the results shown here.

5.6 Discussion conclusion

The results show that H1 and H3 are supported in this study. The only hypothesis which is inconclusive is fear of autonomous robots and artificial intelligence and its impact on customer perception. SEM 2 showed that there was significant impact on customer perception from privacy concerns and distrust of new technologies when customer education and communication is in place as a moderator. This tells us that customer education and communication does significantly impact customer perception, and it does have a clear impact on improvement in privacy concerns and distrust of new technologies. Therefore, one can conclude that privacy concerns and distrust of new technology do have a moderately significant association with customer perception. One can also conclude that customer education and communication has a significant impact on customer perception through its relationship to privacy concerns and distrust of new technology. This means that if Industry 4.0 technologies that impact privacy concerns and distrust of new technologies, such as big data and the internet of things, are communicated to customers and customers are educated on their use, then this will significantly impact and improve customer perceptions in the insurance industry in South Africa.

This confirms the theory that privacy concerns and distrust of new technology do have an impact on customer perception. However, it disproves the theory that fear of autonomous robots and artificial intelligences does not. Further, this research proves that customer education and communication does have a significant impact on improving these variables and their relationship with customer

perceptions of South African insurance providers who use these new technologies.

Therefore, insurance providers who make use of these new technologies should consider the impact on customer's privacy concerns and the distrust that they have of this new technology. The insurance providers also need to ensure that they are building strong customer education and communications into their strategies to improve concerns around privacy and distrust of new technology, to mitigate any negative customer's perceptions towards their brands. Currently, the brands that are used by the segment in this study do have an agreement of positive sentiment, and therefore need to ensure that they maintain this by implementing these communication and education strategies moving forward.

CHAPTER 6. CONCLUSIONS & RECOMMENDATIONS

6.1 Introduction

Industry 4.0 technologies such as big data, artificial intelligence, autonomous robots, and the internet of things are being used by businesses to optimise workflows, production, and the delivery of better customer services (Li, Hou & Wu, 2017). However, the literature shows that there is also a great apprehension from many individuals around the use of these technologies, primarily around the areas of privacy concerns, fear of the autonomous robots and artificial intelligence, and distrust of new technology (Mantzaris & Myloni, 2018). This quantitative research looked at a segment of 395 participants and their responses to each of these areas within the context of South African insurance providers. The research also looked at understanding whether customer education and communication influence these areas and their impact on customer perception. The correlation statistics and structural equation modelling showed that there was a moderately significant impact from privacy concerns and distrust of new technology on customer perceptions. Therefore, Hypothesis 1 and 3 were proved correct, but Hypothesis 2 was proved to be incorrect with no impact on customer perceptions by fear of autonomous robots and artificial intelligence. The data also showed that customer education and communication did have a significant impact on customer perceptions in relation to both privacy concerns and distrust of new technologies, but not fear of autonomous robots and artificial intelligence. Therefore, H4a-c is correct with a significant impact in customer perceptions through customer education and communications impact on privacy concerns and distrust of new technologies.

6.2 Objectives and findings

The objectives of this research were to understand whether privacy concerns, fear of autonomous robots and artificial intelligence, and distrust of new technology have an impact on customer perception of South African insurance providers. A final objective was to assess whether customer education and communication

could impact customer perception, specifically around these areas. Therefore, there were four hypotheses created to be assessed by the online survey, which was sent out, and 395 participants completed the survey. By using correlation statistics and structural equation modelling it was found that a unit increase in privacy concerns and distrust of new technologies had an impact on customer perception by 17.9% and 26% respectively, making them both moderately significant in association. Fear of autonomous robots and artificial intelligence had no relation to customer perception and was not significant at below 5%. Customer education and communication were used as a moderator variable, in relation to the three independent variables. This led to improved customer perceptions impacted by privacy concerns, which were impacted by 43.20% to a significant 61.15%, and customer perceptions impacted by distrust in new technologies were improved by 117.03% to a significant 114.15%.

The most important relationship to understand is the significant impact that customer education and communication have on improving customer perception through improving privacy concerns and distrust of new technologies. H4a-c states that if H1, H2, and H3 are positively proven, then there needs to be a solution, which H4a-c poses is customer education and communication. This is an important factor to understand in this research because there is an issue that could impact customer perception and businesses through not communicating about privacy concerns, the use of personal data, and the use of new technologies. However, if a business were to communicate more clearly and transparently with customers and educate them effectively on how and why these technologies are used then this could help mitigate the risks that could be incurred and their effect on the brand's perception. By improving privacy concerns and distrust of new technology, communications will significantly impact customer perceptions. Insurance providers will be increasingly using these technologies, as with all businesses, and they will need to understand the methods that can be used to ensure that they are not negatively affected by the impact of these potential customer concerns.

6.3 Contributions

This research sought to contribute to a better understanding of the relationship between issues of customer concerns regarding the on-boarding and use of new technologies such as big data, artificial intelligence, autonomous robots, and the internet of things in the context of the insurance industry in South Africa. The primary goal of this research was to understand privacy concerns, fear of autonomous robots and artificial intelligence, and distrust of new technology have an impact on customer perceptions of insurance providers, and whether customer education and communication can impact these relationships positively. Although research has been done around these areas in other contexts and other countries, it has not been conducted in South Africa within the context of the insurance industry, which is increasingly using these technologies to offer better customer service and more effective operations.

This research and its results have made theoretical contributions by supporting the technology acceptance model, which states that individuals do tend to have a negative attitude towards new technologies and that this can be positively impacted by communication and education to ultimately increase the knowledge and understanding of the technology (Davis, 1989). This research positively supports this model and theory through the significant impact that customer education and communication have on customer perceptions in the context of South African insurance providers and the concerns raised with regard to Industry 4.0 technologies. This is done by positively improving privacy concerns and distrust of new technology by communicating transparently and educating customers on the technologies that are used.

The research also contributes to literature in that it proves that privacy concerns and distrust of new technology do have an impact on customer perception, but fear of autonomous robots and artificial intelligences does not. Further, this research proves that customer education and communication does have a significant impact on improving these variables and their relationship with customer perceptions of South African insurance providers who use these new technologies.

The empirical contributions are that there is an understanding that there is a statistically proven, moderately significant association between privacy concerns and distrust of new technologies with customer perceptions, and a significant impact from customer education and communication on customer perceptions related to privacy concerns and distrust of new technologies. This shows that there is a phenomenon of concern around these issues, but also that there is no phenomenon of fear of autonomous robots and artificial intelligence which would affect customer perceptions in this segment of South African insurance customers.

A contextual contribution is understanding this phenomenon within the South African insurance industry, which is increasingly using these technologies, especially considering the COVID-19 pandemic and its impact on increasing usage of new technologies. Practically, this means that businesses will need to look at having policies in place for information systems and marketing to ensure that education and communication with customers are included in any onboarding strategies for new technologies that primarily affect privacy concerns and the distrust of new technology. By ensuring that customers are communicated with and are educated on these technologies, businesses will significantly mitigate the risk of an increase in negative perception which could influence potential customer attrition.

Table 11: Consistency table: research questions, conclusions and contribution to knowledge

RQ #	Research Question	Literature-Based Hypothesis	Conclusion Based on Own Study	Key Differences
8	I think my insurance company's data technologies show concern for the privacy of its users.	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).	Privacy concerns do have a significantly marginal impact on customer perceptions.	There is an impact, which is marginally significant.
9	I feel safe when I send personal information through my insurance company's online technologies.	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).	Privacy concerns do have a significantly marginal impact on customer perceptions.	There is an impact, which is marginally significant.
10	I think my insurance company abides by personal data protection laws.	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).	Privacy concerns do have a significantly marginal impact on customer perceptions.	There is an impact, which is marginally significant.
11	I think my insurance company only collects user personal data that are necessary for its activity.	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).	Privacy concerns do have a significantly marginal impact on customer perceptions.	There is an impact, which is marginally significant.
12	My insurance company does not send e-mail advertising without the user's consent.	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).	Privacy concerns do have a significantly marginal impact on customer perceptions.	There is an impact, which is marginally significant.
13	I think my insurance company shows great concern for the security of any transactions.	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).	Privacy concerns do have a significantly marginal impact on customer perceptions.	There is an impact, which is marginally significant.
14	I think my insurance company has sufficient technical capacity to ensure that the data I send will not be intercepted or modified by hackers or third parties.	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).	Privacy concerns do have a significantly marginal impact on customer perceptions.	There is an impact, which is marginally significant.
15	Robots that can make their own decisions and take their own actions.	Fear of autonomous robots and artificial intelligence impact customer perception Liang & Lee, 2017).	Fear of autonomous robots and artificial intelligence does not have an impact on customer perceptions.	There is no impact on customer perception.

RQ #	Research Question	Literature-Based Hypothesis	Conclusion Based on Own Study	Key Differences
16	Robots replacing people in the workforce.	Fear of autonomous robots and artificial intelligence impact customer perception Liang & Lee, 2017).	Fear of autonomous robots and artificial intelligence does not have an impact on customer perceptions.	There is no impact on customer perception.
17	Artificial Intelligence.	Fear of autonomous robots and artificial intelligence impact customer perception Liang & Lee, 2017).	Fear of autonomous robots and artificial intelligence does not have an impact on customer perceptions.	There is no impact on customer perception.
18	People trusting Artificial Intelligence to do work.	Fear of autonomous robots and artificial intelligence impact customer perception Liang & Lee, 2017).	Fear of autonomous robots and artificial intelligence does not have an impact on customer perceptions.	There is no impact on customer perception.
19	I believe that my insurance company will employ data and online technologies in my best interest.	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.
20	If I required help, my insurance company's technological system would do its best to help me.	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.
21	My insurance company's technological system would be concerned about my well-being, not just its own.	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.
22	My insurance company's technological system would perform its role of securely storing personal information about citizens very well.	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.
23	Overall, my insurance company's technological system would be a capable and proficient means for identifying citizens.	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.

RQ #	Research Question	Literature-Based Hypothesis	Conclusion Based on Own Study	Key Differences
24	In general, my insurance company's technological system would have sufficient information about citizens.	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.
25	My insurance company's technological system is trustworthy.	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.
26	I would characterise my insurance company's technological system as honest.	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.
27	My insurance company's technological system keeps its commitments.	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.
28	My insurance company's technological system is sincere and genuine.	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.
29	I usually trust a technology until it gives me a reason not to trust it.	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.
30	I generally give a technology the benefit of the doubt when I first use it.	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.
31	My insurance company makes an effort to increase my knowledge of the products and services they offer.	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Customer education and communication does significantly impact customer perception related to privacy concerns and distrust of new technologies.	There is a significant impact on customer perception through customer education and communication.

RQ #	Research Question	Literature-Based Hypothesis	Conclusion Based on Own Study	Key Differences
32	My insurance company tries to improve my skills needed to assess the pros and cons of the different services they offer.	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Customer education and communication does significantly impact customer perception related to privacy concerns and distrust of new technologies.	There is a significant impact on customer perception through customer education and communication.
33	My insurance company takes the time to provide me with all information I need on their way of doing things.	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Customer education and communication does significantly impact customer perception related to privacy concerns and distrust of new technologies.	There is a significant impact on customer perception through customer education and communication.
34	My insurance company gives me all the tools necessary to make informed decisions about the services I buy from them.	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Customer education and communication does significantly impact customer perception related to privacy concerns and distrust of new technologies.	There is a significant impact on customer perception through customer education and communication.
35	My insurance company asks for suggestions and feedback.	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Customer education and communication does significantly impact customer perception related to privacy concerns and distrust of new technologies.	There is a significant impact on customer perception through customer education and communication.
36	My insurance company listens to complaints.	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Customer education and communication does significantly impact customer perception related to privacy concerns and distrust of new technologies.	There is a significant impact on customer perception through customer education and communication.
37	I like my insurance company.	Privacy concerns, fear of autonomous robots and artificial intelligence and distrust of new technology impact customer perception, and this can be impacted by customer education and communication (Vera & Trujillo, 2017).	Customer perceptions are marginally impacted by privacy concerns and distrust of new technology and are significantly impacted by customer education and communication.	There is a marginally significant impact on customer perception through improved privacy concerns and distrust of new technologies.

RQ #	Research Question	Literature-Based Hypothesis	Conclusion Based on Own Study	Key Differences
38	Next time I need insurance I am going to purchase from this insurance company.	Privacy concerns, fear of autonomous robots and artificial intelligence and distrust of new technology impact customer perception, and this can be impacted by customer education and communication (Vera & Trujillo, 2017).	Customer perceptions are marginally impacted by privacy concerns and distrust of new technologies and are significantly impacted by customer education and communication.	There is a marginally significant impact on customer perception through improved privacy concerns and distrust of new technologies.
39	I will recommend this insurance company to my friends and family.	Privacy concerns, fear of autonomous robots and artificial intelligence and distrust of new technology impact customer perception, and this can be impacted by customer education and communication (Vera & Trujillo, 2017).	Customer perceptions are marginally impacted by privacy concerns and distrust of new technologies and are significantly impacted by customer education and communication.	There is a marginally significant impact on customer perception through improved privacy concerns and distrust of new technologies.

6.4 Recommendations

It is recommended that businesses put in place specific measures to mitigate the potential negative effects of customer perception due to the on-boarding of new technology. Firstly, before a business embarks on any new technology, they need to ensure that this technology is in the best interests of the customer and will improve the customer experience and therefore the trust and perception of the brand. The insurance industry was shown to be saturated after the initial questions regarding insurance providers. The important factor to ensure that brands are successful is to clearly differentiate one brand from its competitors. The way that the research has shown this to be true is in H4-ac, where communication not only encompasses communicating to customers but also receiving feedback and engaging with insights from customer on an ongoing basis. This can be carried out through multiple means such as Net Promoter Score survey feedback, a general customer feedback survey on experience and customer insights to understand customer retention insights around technology, customer experience and customer journey expectations.

This leads to the second recommendation, that the business needs to ensure that the correct system or technology is on-boarded and will have the most positive impact, not just for the business, but for the customer and their service expectations from the business. Businesses need to ensure that the customer is at the centre of all business operations, not just for acquisitions but also for retentions. The research shows that if customer communication and education are on-boarded correctly, they can have a significant effect and much of this is through feedback being used by the businesses. This needs to be done by following clear systems request for proposal process where the objectives are clearly highlighted and keep the customer's experience and expectations at the core of any on-boarding project.

Thirdly, the business needs to investigate communicating with the customer by potentially conducting internal research to understand where the gaps are, and whether or not the customer feels the need for the business to onboard a new technology for customisation and improvement of services. This is often done

through net promoter score surveys and by listening in to customer interactions or social listening on social media channels. Many digital analytics tools also give businesses the opportunity to understand where their gaps and opportunities are in their customer experiences.

The final recommendation is for businesses to be communicating, on an ongoing basis, with customers as to what technology is being used and to be transparent about what the technology is used for and how it may affect the customer. This will ensure that customers understand the technology and are more likely to accept it and have fewer concerns, which will significantly impact customer perceptions towards the business. By employing a customer relationship marketing system and policy businesses will ensure that customers are engaged and knowledgeable. Another important factor to this is educating employees so that they in turn educate and effectively communicate with customers.

When all of these recommendations are put in place, businesses will not only be positively impacted in terms of retention of existing customers but will in turn have a strong effect on acquisitions through positive sentiment, word of mouth and reviews into service.

6.5 Limitations

This research was conducted at the beginning of the lockdown from the COVID-19 Pandemic. It needs to be considered that this may affect the outcome of some of the perceptions towards technologies.

Another limitation relates to the amount of research that has been conducted around new technologies in South Africa and other developing countries. Dentsu Aegis Network (2020) showed that there is a propensity to be more accepting of new technologies and data collection due to the increased need for this service in these countries. However, many of the research articles used in the literature review, which showed the opportunity to conduct this study, were based in countries other than South Africa, and therefore they may have seen a possible negative perception concerning the use of these technologies that is not present

in South Africa. Future research would need to be conducted in other countries that are relevant to a specific context of understanding a country-based difference with this.

6.6 Suggestions for further research

It is recommended that further research be conducted to understand whether customer control could be a potential factor in increasing this positive perception. If the customer already has a positive perception that is impacted by communication and education from the business, then could ensuring that the customer has increased control over their data, and how it is used, have an increased positive effect? A further recommendation is to conduct an experiment-based study to further understand the direct effects of activity that is conducted between these technologies and customers and their perception before and after interactions based on both positive and negative customers experiences.

6.7 Conclusion

The research conducted in this study shows that privacy concerns and distrust of new technologies do influence customer perception, and that customer education and communication has a significant impact on customer perception through its impact on improving privacy concerns and distrust of new technology, in the context of the South African insurance industry. Therefore, it must be concluded that the technology acceptance model, by Davis (1989) is supported by this research. Further to this, the theories that privacy concerns and distrust of new technologies impact customer perceptions are also supported by this research. However, Liang and Lee's (2017) theory of FARAI is not supported by this research. Businesses should therefore be looking to manage the onboarding processes of these new technologies both internally and externally by ensuring that they educate and communicate with their customers effectively on their use of these technologies. This will ensure that these businesses mitigate risks to their customer's perception of them, and therefore they can maintain good

relationships with customers, which will positively affect their customer lifetime value through retention and easier acquisition of new customers.

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APPENDIX A: Participant Information Sheet



UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

Dear Sir / Madam,

My name is Mary Busschau and I am a Masters student in Masters in Management in Strategic Marketing at the University of the Witwatersrand in Johannesburg. As part of my studies, I have to undertake a research project, and I am investigating Industry 4.0 technologies and customer perception in the insurance industry. The aim of this research project is to understand the relationship between customer perceptions of insurance brands that use technologies. The research is titled: **A Study of Industry 4.0 Technologies and Customer Perception in the Insurance Industry.**

As part of this project, I would like to invite you to take part in an in answering an online survey, at the following link: https://wits.eu.qualtrics.com/jfe/form/SV_8p2UMGM8onxUqgJ. This activity will involve answering questions based on whether you agree with the statement or not and will take around ten minutes.

You will not receive any direct benefits from participating in this research, and there are no disadvantages or penalties for not participating. You may withdraw at any time or not answer any question if you do not want to. The survey will be completely confidential and anonymous as I will not be asking for your name or any identifying information, and the information you give to me will be held securely and not disclosed to anyone else. I will be using a pseudonym (false name) to represent your participation in my final research report. If you experience any distress or discomfort at any point in this process, you may stop the survey or

resume another time. By completing and submitting this online survey it is taken to mean consent.

If you have any questions during or afterwards about this research, feel free to contact me or my supervisor on the details listed below. This study will be written up as a research report which will be available online through the university library website. If you wish to receive a summary of this report, I will be happy to send it to you. If you have any concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email Shaun.Schoeman@wits.ac.za.

Yours sincerely,

Researcher: Mary Busschau, mbusschau@gmail.com, 0828638583

Supervisor: Dr Thomas Anning-Dorson, thomas.dorson.anning@wits.ac.za, 0117173951

APPENDIX B: Instrument

4th Industrial Revolution Technologies in the Insurance Industry

Start of Block: Block 1

Good Day,

My name is Mary Busschau and I am a Masters student in Masters in Management in Strategic Marketing at the University of the Witwatersrand in Johannesburg. As part of my studies, I have to undertake a research project, and I am investigating Industry 4.0 technologies, such as Big Data, AI and Connected Devices, and customer perception in the insurance industry. The aim of this research project is to understand the relationship between customer perceptions of insurance brands that use technologies. The research is titled: A Study of Industry 4.0 Technologies and Customer Perception in the Insurance Industry.

As part of this project, I would like to invite you to take part in an in answering an online survey. This activity will involve answering questions based on whether you agree with the statement or not and will take around ten minutes.

You will not receive any direct benefits from participating in this research, and there are no disadvantages or penalties for not participating. You may withdraw at any time or not answer any question if you do not want to. The survey will be completely confidential and anonymous as I will not be asking for your name or any identifying information, and the information you give to me will be held securely and not disclosed to anyone else. I will be using a pseudonym (false name) to represent your participation in my final research report. If you experience any distress or discomfort at any point in this process, you may stop the survey or resume another time. By completing and submitting this online survey it is taken to mean consent.

If you have any questions during or afterwards about this research, feel free to contact me or my supervisor on the details listed below. This study will be written up as a research report which will be available online through the university library

website. If you wish to receive a summary of this report, I will be happy to send it to you. If you have any concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email Shaun.Schoeman@wits.ac.za.

Yours sincerely,

Researcher: Mary Busschau, 0708138y@students.wits.ac.za

Supervisor: Dr Thomas Anning-Dorson, thomas.dorson.anning@wits.ac.za, 0117173951

End of Block: Block 1

Start of Block: Default Question Block

This survey is to understand perceptions of 4th Industrial Revolution technologies such as Big Data, Artificial Intelligence and Connected Devices, in the insurance industry in South Africa. This research form part of a research study for Masters in Management.

All responses are anonymous and are only used for the academic purposes of this research. All participants in this survey must be over 18 years old.

By completing and submitting this survey this is taken as consent to take part in this research, and for your responses to be included in this report.

Q1 What is your gender?

- Male
- Female
- Prefer not to say

Q2 What is your age?

- 18 - 25 Years
- 25 - 34 Years
- 35 - 44 Years
- 45 - 54 Years
- 55 - 64 Years
- 65 - 74 Years
- 75 Years or Older

Q3 Are you?

Black

White

Coloured

Indian

Asian

Other _____

Prefer not to say

Q4 Do you have insurance?

Yes

No

Q5 What types of insurance do you have? (Select more than one if required)

- Health Insurance / Medical Aid
- Life Insurance
- Funeral Cover
- Vehicle Insurance (eg. Car, Motorcycle, Caravan)
- House and Home Contents Insurance
- Portable Possessions Insurance (eg. Cellphone, Handbag, Jewellery)
- Business Insurance
- Building Insurance
- Cyber Insurance
- Other _____

Q6 Which company do you have insurance with? (Select more than one if required)

- 1Life
- 1st for Women
- AA Car Insurance
- Absa
- Affinity Health
- Auto and General
- AVBOB
- Budget Insurance
- Capitec
- Clientele
- Dialdirect
- Discovery
- Doves
- FNB
- Hollard

- King Price
- Liberty
- MiWay
- Momentum
- Old Mutual
- OUTsurance
- Santam
- Standard Bank
- Other _____

Q7 Who is your preferred insurance provider?

- 1Life
- 1st for Women
- AA Car Insurance
- Absa
- Affinity Health
- Auto and General
- AVBOB
- Budget Insurance
- Capitec
- Clientele
- Dialdirect
- Discovery
- Doves
- FNB
- Hollard
- King Price
- Liberty
- MiWay

- Momentum
- Old Mutual
- OUTsurance
- Santam
- Standard Bank
- Other _____

End of Block: Default Question Block

Start of Block: Block 2

Q8 I think my insurance company's data technologies show concern for the privacy of its users.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q9 I feel safe when I send personal information through my insurance company's online technologies.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q10 I think my insurance company abides by personal data protection laws.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q11 I think my insurance company only collects user personal data that are necessary for its activity.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q12 My insurance company does not send e-mail advertising without the user's consent.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q13 I think my insurance company shows great concern for the security of any transactions.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q14 I think my insurance company has sufficient technical capacity to ensure that the data I send will not be intercepted or modified by hackers or third parties.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

End of Block: Block 2

Start of Block: Block 3

How afraid are you of the following?

Q15 Robots that can make their own decisions and take their own actions.

- Very afraid
- Afraid
- Indifferent
- Slightly afraid
- Not afraid

Q16 Robots replacing people in the workforce.

- Very afraid
- Afraid
- Indifferent
- Slightly afraid
- Not afraid

Q17 Artificial Intelligence.

- Very afraid
- Afraid
- Indifferent
- Slightly afraid
- Not afraid

Q18 People trusting Artificial Intelligence to do work.

- Very afraid
- Afraid
- Indifferent
- Slightly afraid
- Not afraid

End of Block: Block 3

Start of Block: Block 4

Q19 I believe that my insurance company will employ data and online technologies in my best interest.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q20 If I required help, my insurance company's technological system would do its best to help me.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q21 My insurance company's technological system would be concerned about my well-being, not just its own.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

End of Block: Block 4

Start of Block: Block 5

Q22 My insurance company's technological system would perform its role of securely storing personal information about citizens very well.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q23 Overall my insurance company's technological system would be a capable and proficient means for identifying citizens.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q24 In general, my insurance company's technological system would have sufficient information about citizens.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

End of Block: Block 5

Start of Block: Block 6

Q25 My insurance company's technological system is trustworthy.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q26 I would characterise my insurance company's technological system as honest.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q27 My insurance company's technological system keeps its commitments.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q28 My insurance company's technological system is sincere and genuine.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q29 I usually trust a technology until it gives me a reason not to trust it.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q30 I generally give a technology the benefit of the doubt when I first use it.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

End of Block: Block 6

Start of Block: Block 7

Q31 My insurance company makes an effort to increase my knowledge of the products and services they offer.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q32 My insurance company tries to improve my skills needed to assess the pros and cons of the different services they offer.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q33 My insurance company takes the time to provide me with all information I need on their way of doing things.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q34 My insurance company gives me all the tools necessary to make informed decisions about the services I buy from them.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

End of Block: Block 7

Start of Block: Block 8

Q35 My insurance company asks for suggestions and feedback.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q36 My insurance company listens to complaints.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q37 I like my insurance company.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q38 Next time I need insurance I am going to purchase from this insurance company.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q39 I will recommend this insurance company to my friends and family.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

End of Block: Block 8

APPENDIX C: Figures and Tables

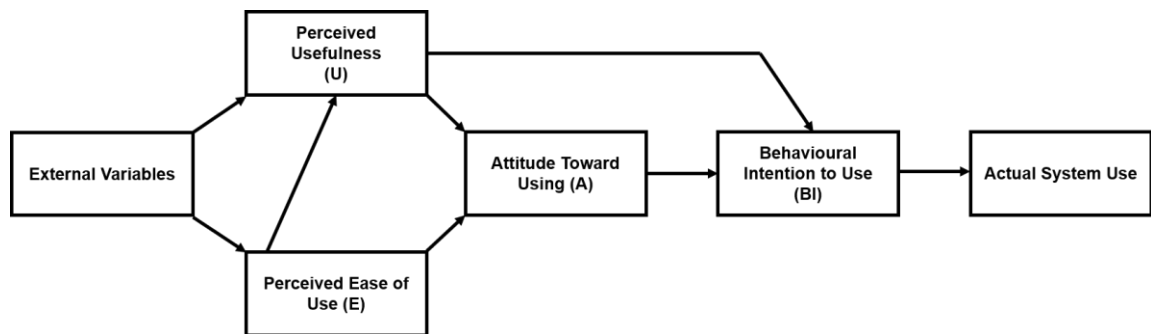


Figure 1: Technology acceptance model (Davis, 1989)

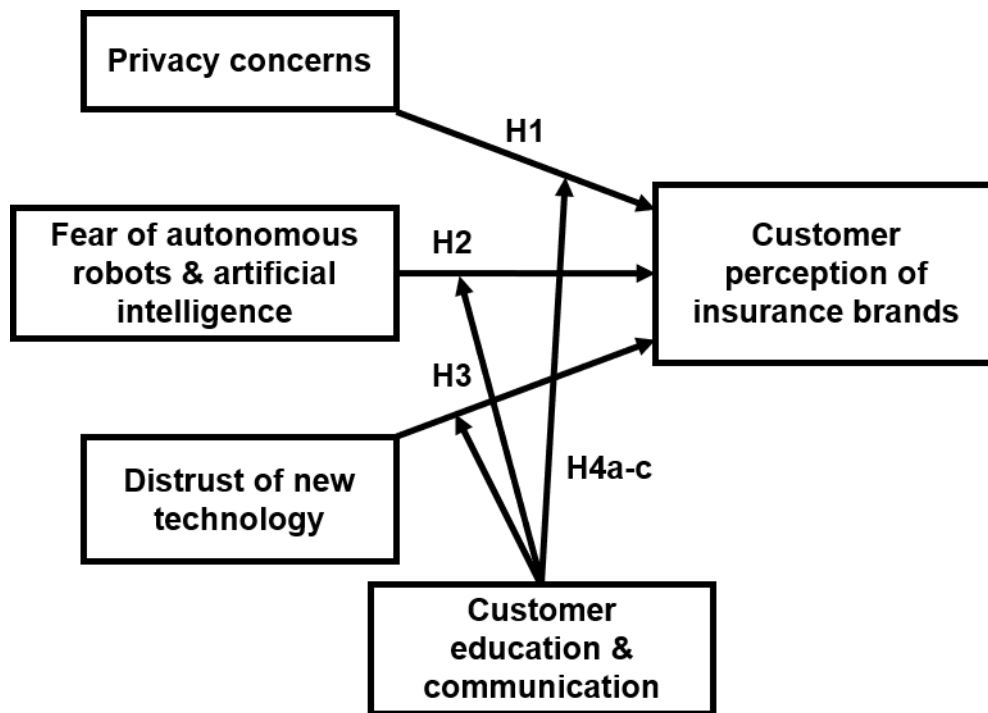


Figure 2: Hypothesized model

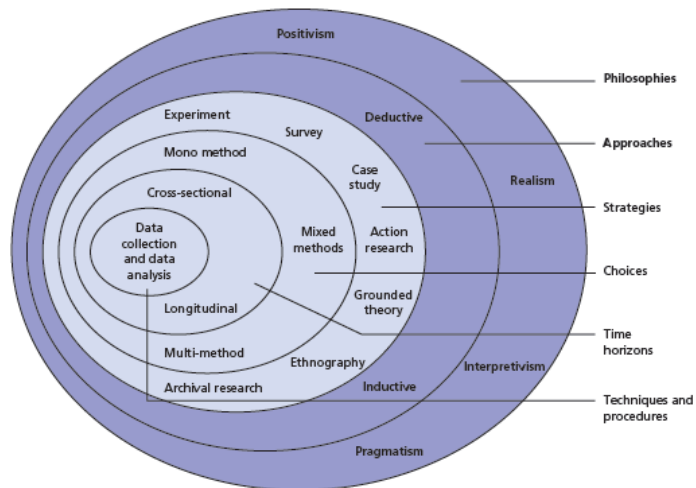


Figure 3: Research onion (Saunders, Lewis, & Thornhill, 2009).

Table 2: Demographics

	Variable	Freq	Percent
Gender	Male	152	38.48
	Female	243	61.52
Age group	18 - 25 Years	64	16.20
	25 - 34 Years	169	42.78
	35 above	162	41.01
Population group	Black	174	44.05
	White	153	38.73
	Indian	35	8.86
	Coloured	13	3.29
	Other	9	2.28
	Prefer not to say	8	2.03
	Asian	3	0.76

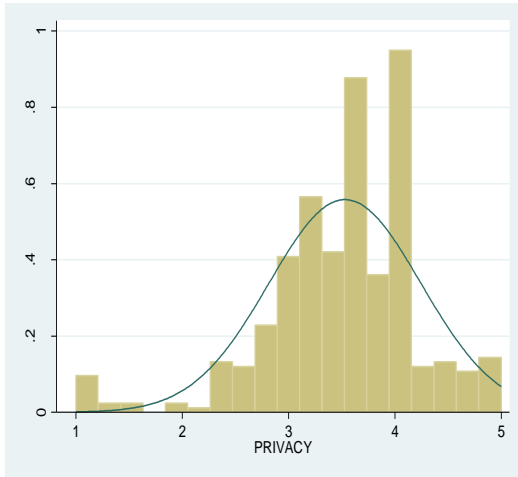


Figure 4: Privacy

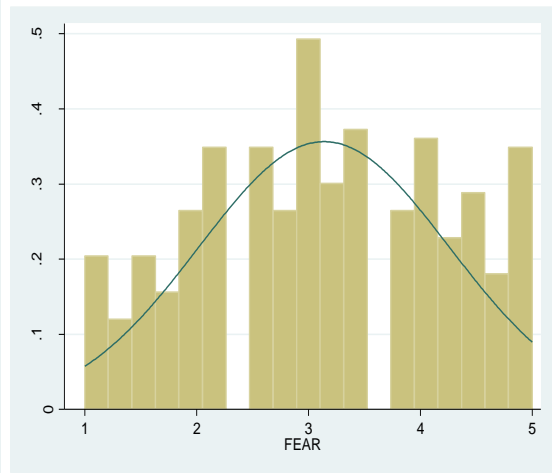


Figure 5: Fear

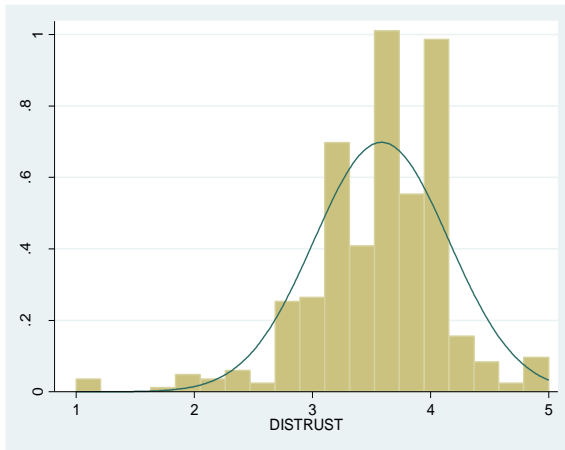


Figure 6: Distrust

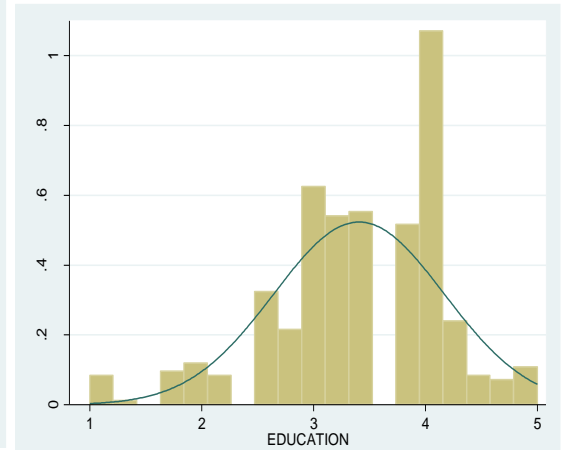


Figure 7: Customer education

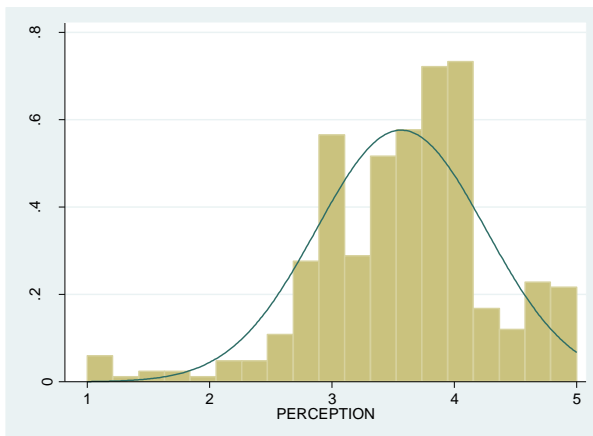


Figure 8: Customer perception

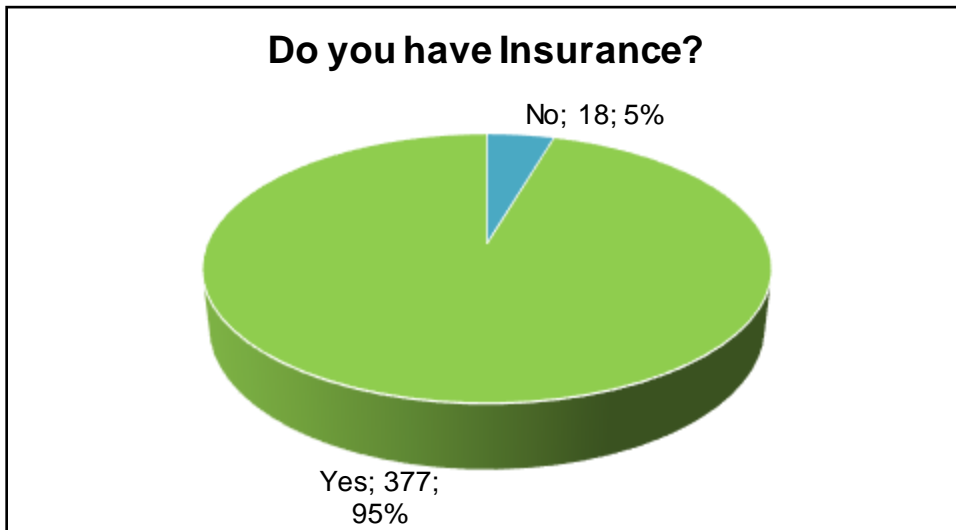


Figure 9: Insurance status

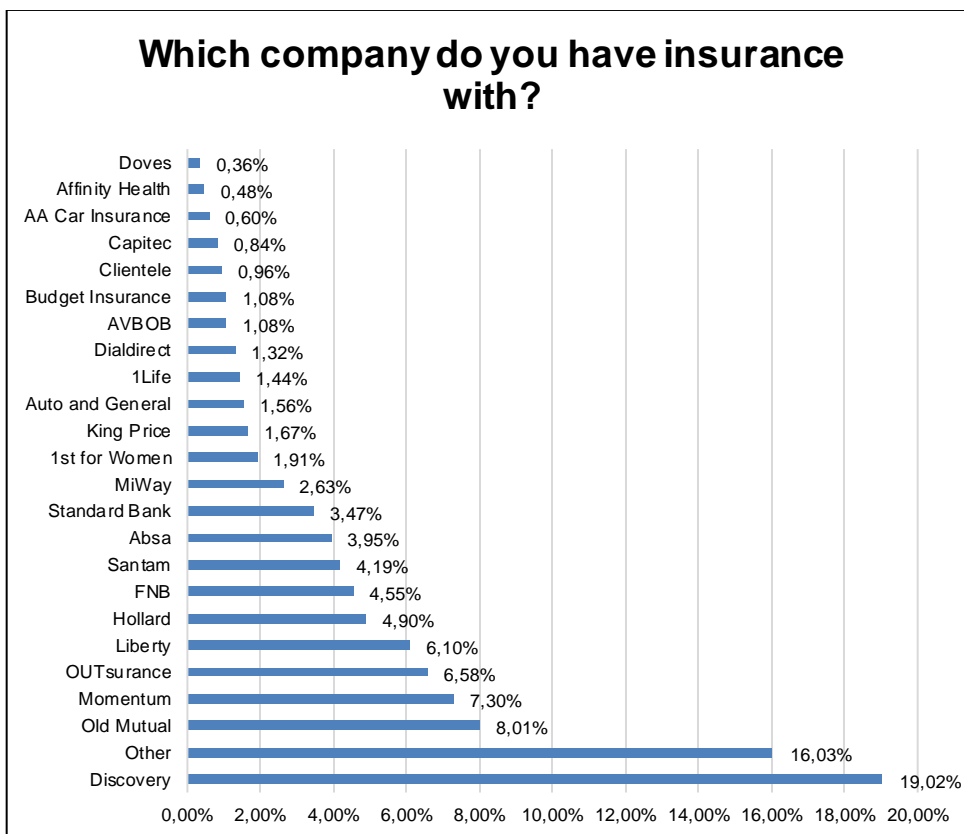


Figure 10: Insurance providers

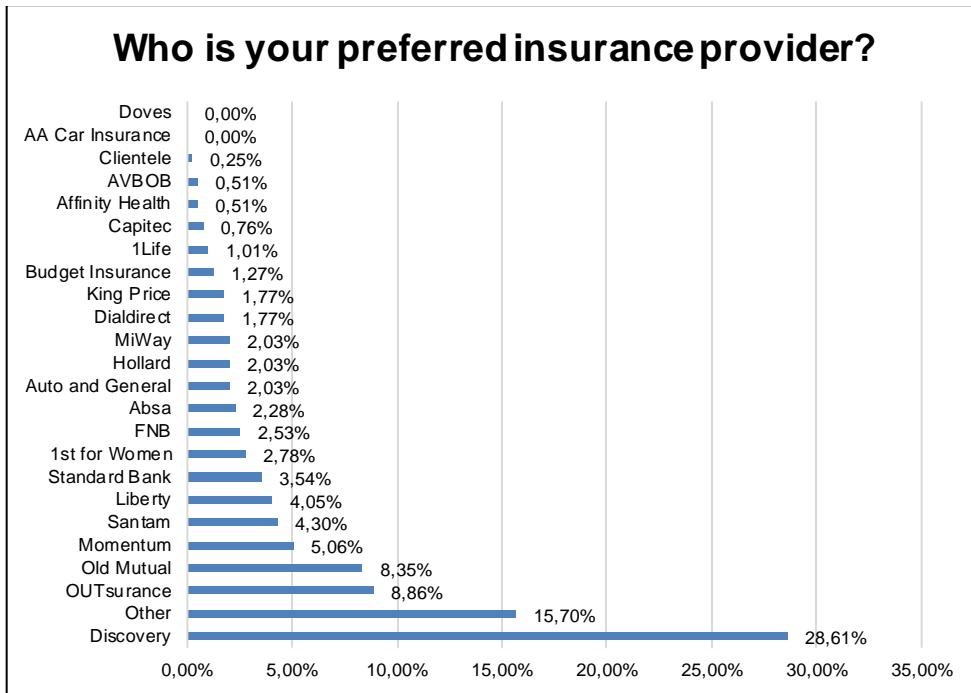


Figure 11: Preferred insurance provider

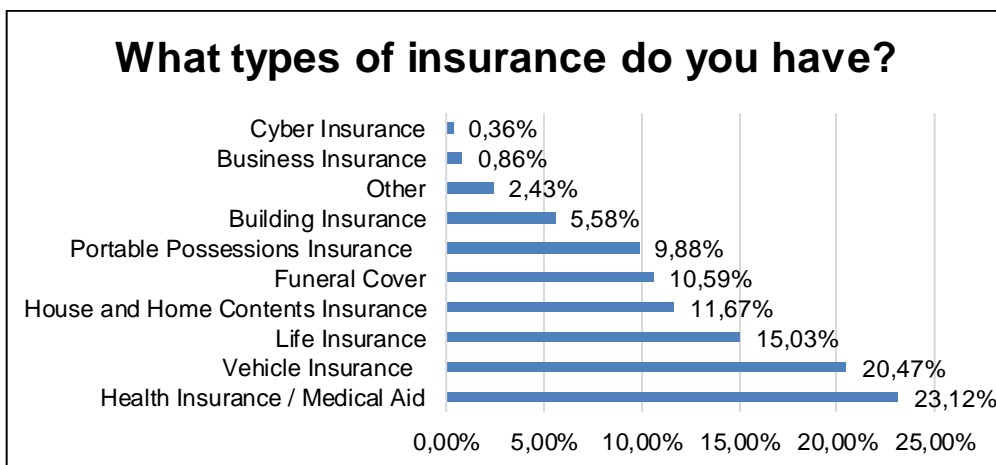
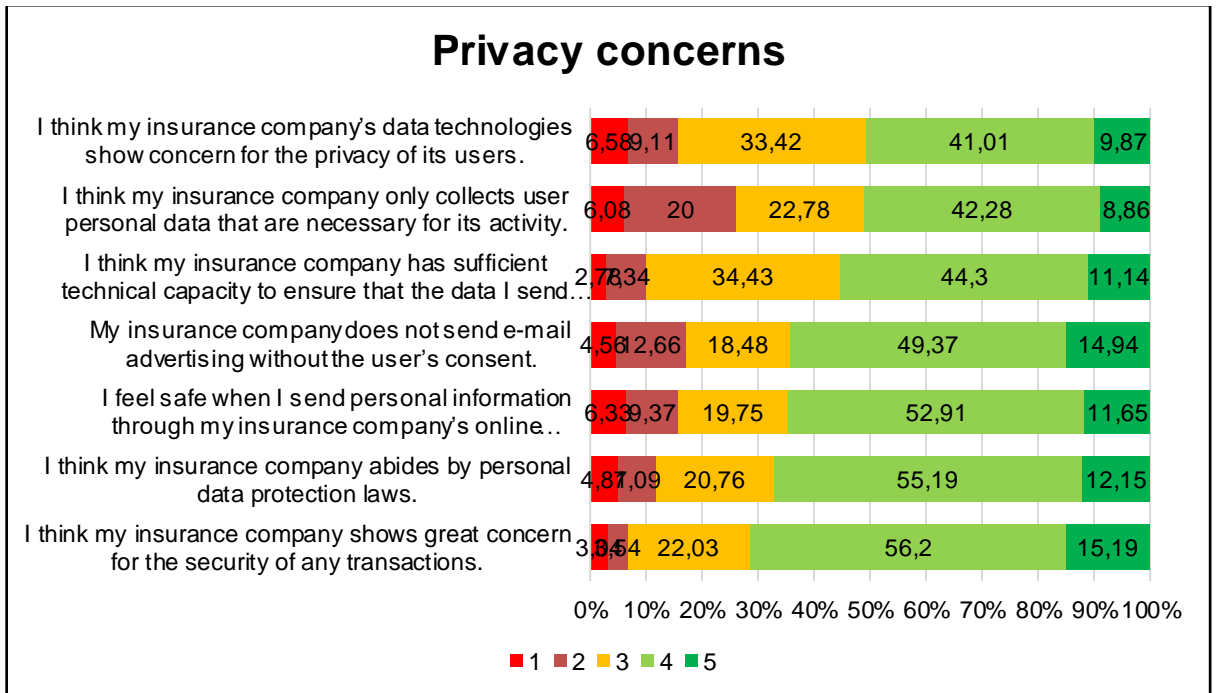
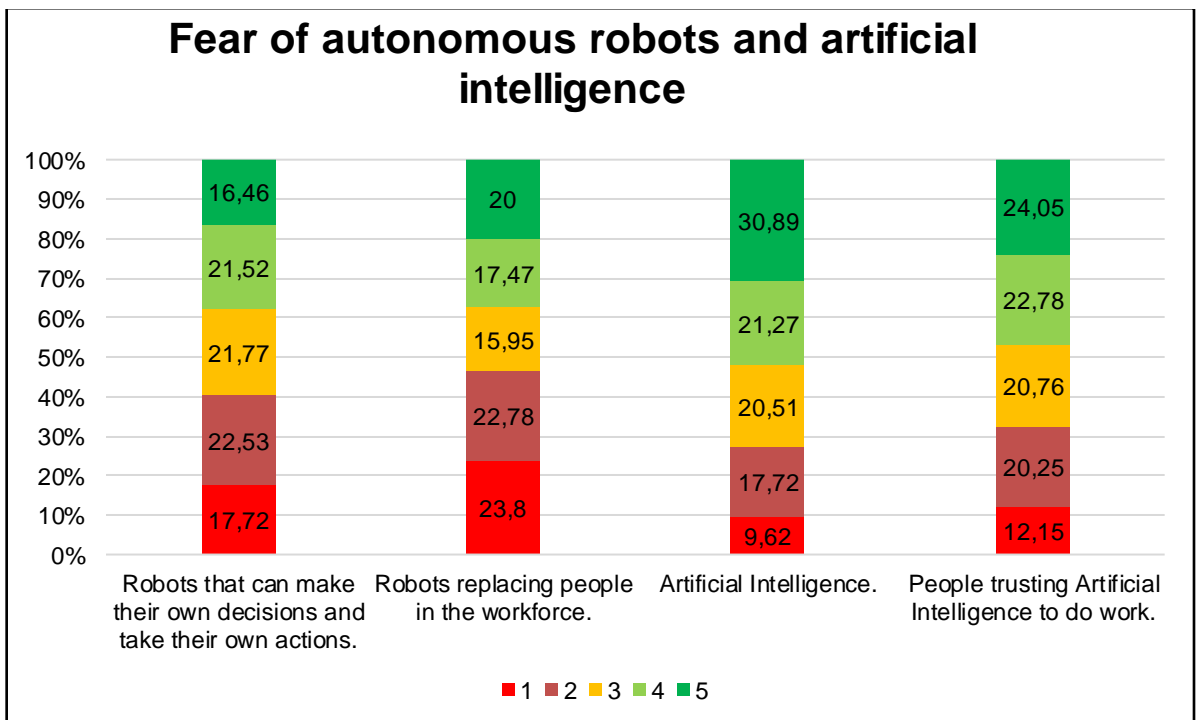


Figure 12: Types of insurance



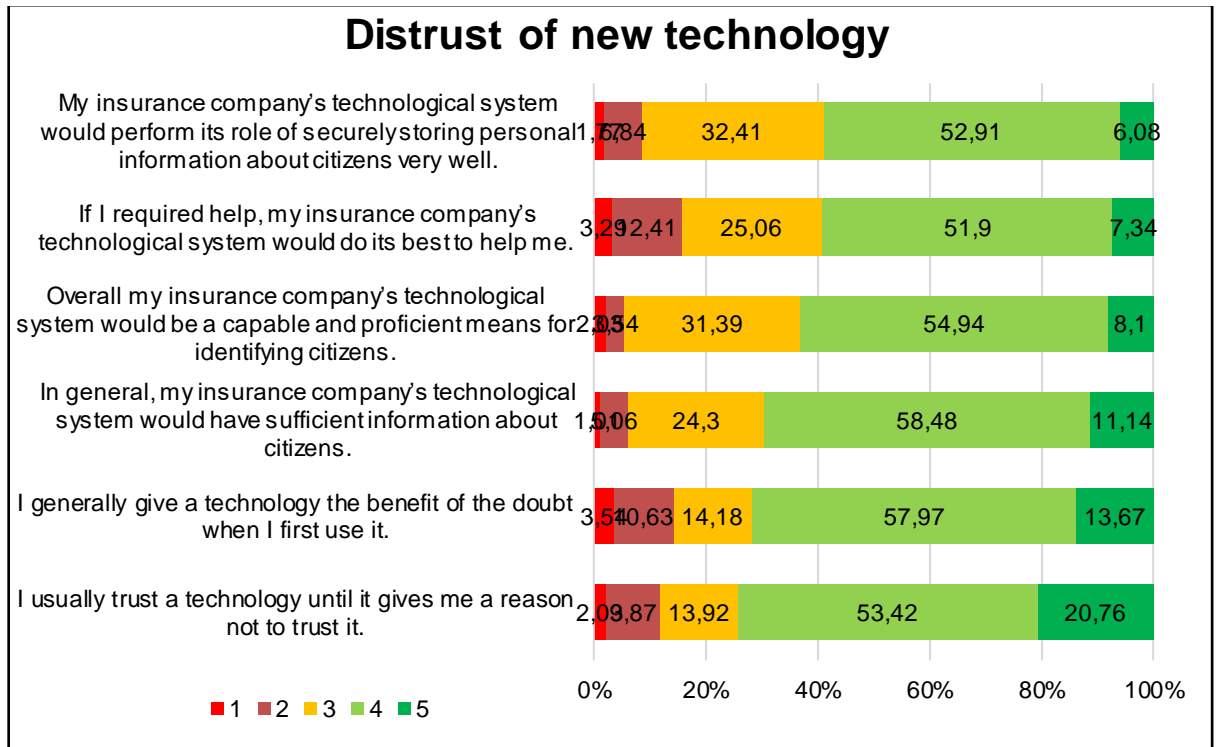
1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree

Figure 13: Privacy concerns



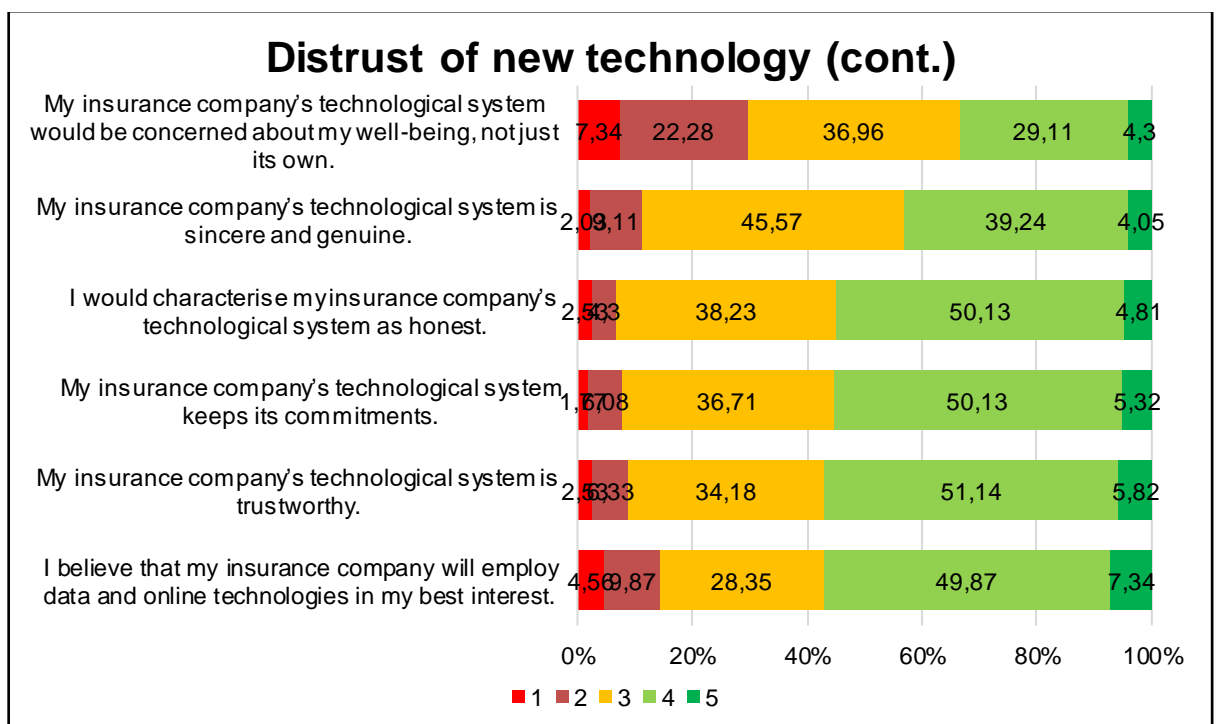
1=Not afraid 2=Slightly afraid 3=Indifferent 4=Afraid 5=Very afraid

Figure 14: Fear of autonomous robots and artificial intelligence



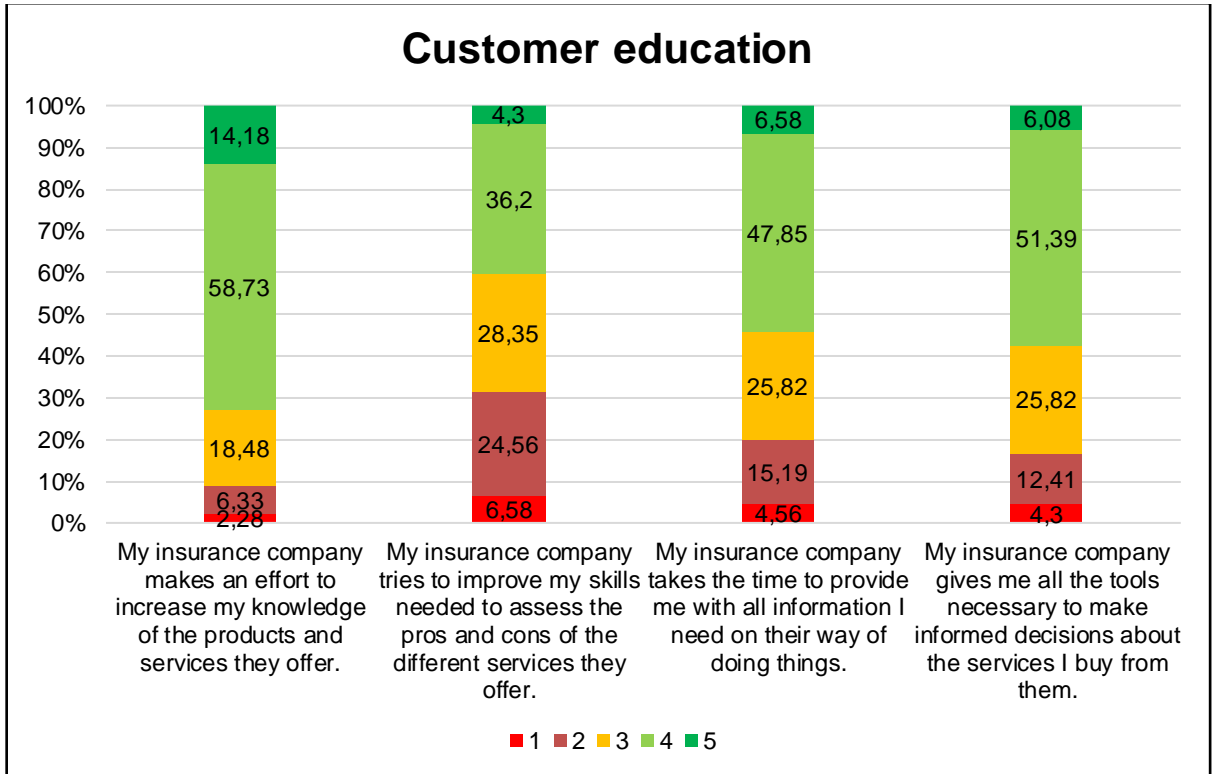
1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree

Figure 15: Distrust of new technologies 1



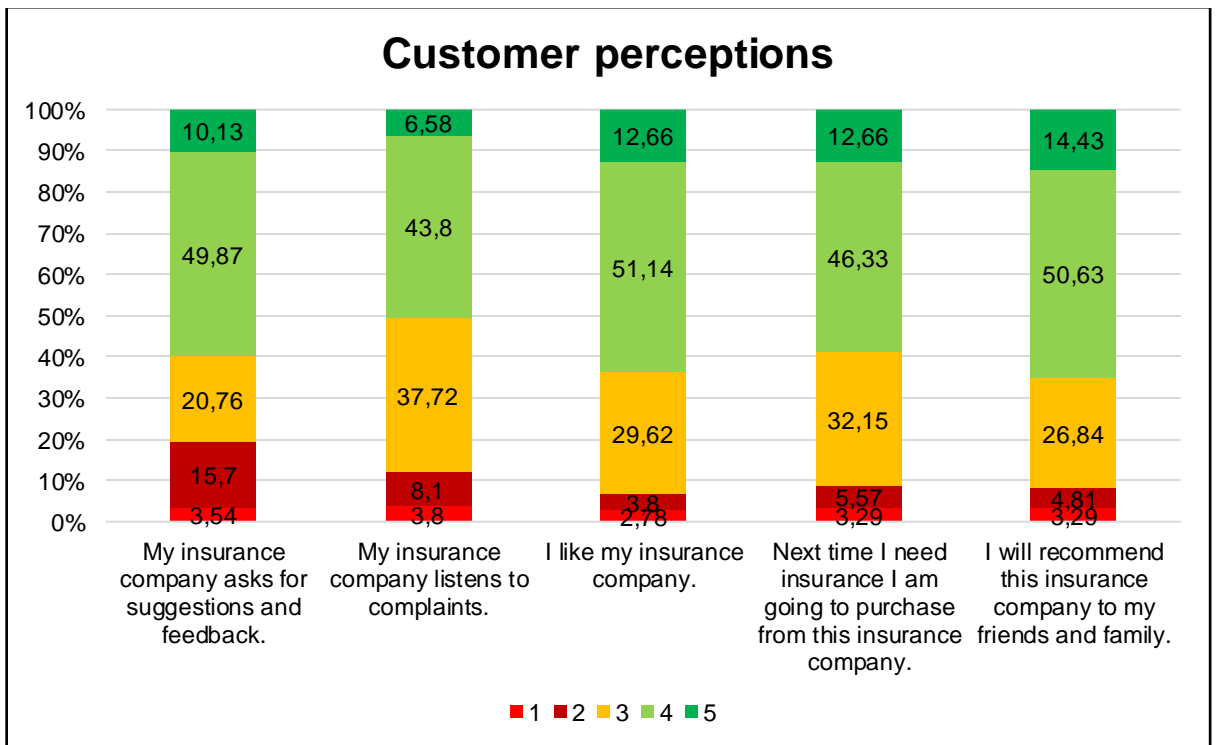
1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree

Figure 16: Distrust of new technologies 2



1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree

Figure 17: Customer education



1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly agree

Figure 18: Customer perceptions

Table 4: Reliability

Reliability	Test scale = mean (unstandardised items)					
			item-test	item-rest	interitem	
Item	Obs.	Sign	corr.	corr.	cov.	alpha
Privacy	395	+	0.7606	0.554	0.248997	0.7779
Fear	395	+	0.5058	0.0705	0,2365624	0.799
Distrust	395	+	0.8179	0.6945	0.242885	0.7217
Education	395	+	0.797	0.5946	0.22604	0.761
Perception	395	+	0.8055	0.6353	0.228327	0.7368
Test scale					0.236562	0.799

Table 5: Associations between variables

	Perceptions	Privacy	Fear	Distrust	Education	Gender	Age
Perceptions	1						
Privacy	0.4551*	1					
Fear	0.0344	0.1053*	1				
Distrust	0.5319*	0.5934*	0.162*	1			
Education	0.5661*	0.3753*	-0.084	0.5459*	1		
Gender	0.0882	0.0547	0.115*	0.0693	0.1402*	1	
Age	0.0106	0.1050*	0.168*	0.0184	-0.06	-0.0698	1
Race	-0.0336	0.0336	0.0589	-0.0207	-0.0314	0.0575	0.033

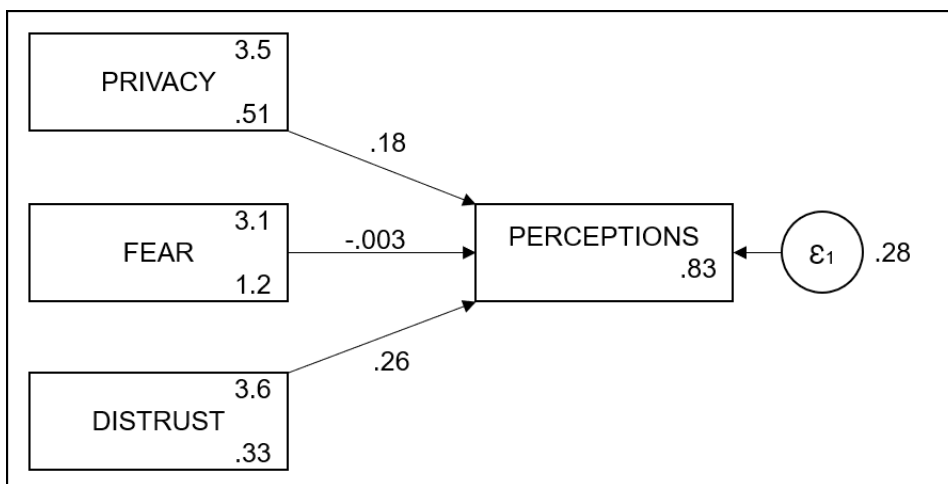


Figure 19: Pathway analysis 1

Table 6: Structural equation model regression 1

Coef.	Std.	Err.	z	P>z	[95%	Conf.
Structural						
Perceptions	<-					
Privacy	0.179506	0.046561	3.86	0	0.088248	0.27076
Fear	-0.00301	0.024083	-0.12	0.901	-0.05021	0.04419
Distrust	0.261165	0.064588	4.04	0	0.134575	0.38776
Education	0.343869	0.042028	8.18	0	0.261496	0.42624
_cons	0.834712	0.18606	4.49	0	0.47004	1.199383

Table 7: Model fit statistics 1

Fit statistic	Value		Description
Likelihood ratio			
chi2_ms(0)	0	Assess the overall fit and the discrepancy between the sample and fitted covariance matrices. H0: The model fits perfectly.	model vs. saturated
p > chi2			
chi2_bs(4)	210.67		baseline vs. saturated
p > chi2	0		
Population error			
RMSEA	0	Root mean squared error of approximation	Probability of RMSEA should be <= 0.05
90% CI, lower	0	0 represents a good fit.	
upper bound	0		
pclose	1	the p-value for a test of close fit	
Information criteria			
AIC	3956.3	Akaike's information criterion	Smaller values indicate a better fit.
BIC	3980.1	Bayesian information criterion	
Baseline comparison			
CFI	1	Comparative fit index	A value close to 1 indicates a good fit. CFI ≥.90
TLI	1	Tucker-Lewis index	
Size of residuals			
SRMR	0	Standardized root mean squared residual	Model if fit when SRMR <0.08
CD	0.413	Coefficient of determination	

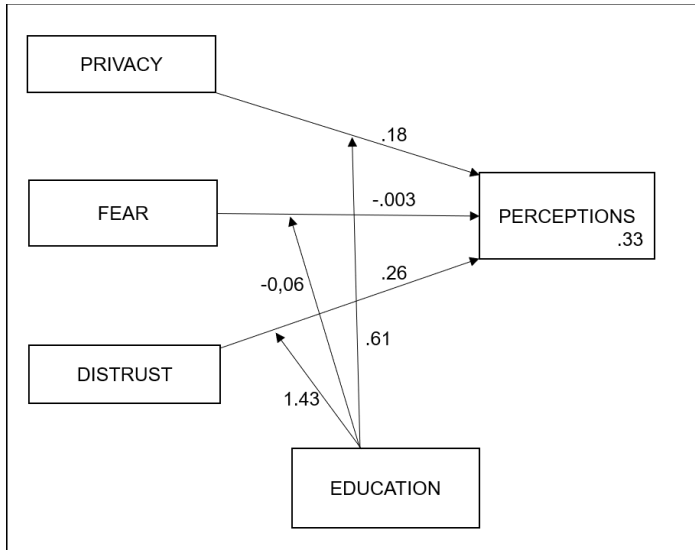


Figure 20: Pathway analysis 2

Table 8: Structural equation model regression 2

	Coef.	Std Err.	z	P>z	[95%	Conf. Interval]
Structural						
Perceptions	<-					
Privacy*Education	0,611476	0,145951	4,19	0	0,325417	0,8975339
Fear*Education	-0,05691	0,075471	-0,75	0,451	-0,20483	0,0910068
Distrust*Education	1,431513	0,182672	7,84	0	1,073483	1,789543
_cons	1,121037	0,197619	5,67	0	0,733711	1,508363
var(e.Perceptions)	0,32785	0,023329	0,285171	0,376915		

Table 9: H4a-c comparison

	H1-3 Coef.	H4a-c Coef.	Change By
Structural			
Perceptions	<-		
Privacy	0.179506	0.352	0.1725
Fear	-0.00301	-0.012	-0.0090
Distrust	0.261165	0.4092	0.1480

APPENDIX D: Ethical Clearance Certificate



Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)
R14/49 Busschau

CLEARANCE CERTIFICATE

PROTOCOL NUMBER: H20/02/4

PROJECT TITLE

A study of industry 4.0 technologies and customer perception in the insurance industry

INVESTIGATOR(S)

Miss M Busschau

SCHOOL/DEPARTMENT

Wits Business School/

DATE CONSIDERED

14 February 2020

DECISION OF THE COMMITTEE

Approved
Risk Level: Minimal

EXPIRY DATE

17 March 2023

DATE 18 March 2020

CHAIRPERSON

(Professor J Knight)

cc: Supervisor : Prof T Anning-Dorson

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University. Unreported changes to the application may invalidate the clearance given by the HREC (Non-Medical)

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to completion of a yearly progress report.**

Signature

____/____/____
Date

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

APPENDIX E: Research Confirmation Letter



OFFICE OF THE DEPUTY REGISTRAR

23 April 2020

Mary Busschau
Student number 0708138Y
Master's in Management (Strategic Marketing)
Faculty of CLM

TO WHOM IT MAY CONCERN

"A study of Industry 4.0 technologies and customer perception in the insurance industry"

This letter serves to confirm that the above project has received permission to be conducted on University premises, and/or involving staff and/or students of the University as research participants. In undertaking this research, you agree to abide by all University regulations for conducting research on campus and to respect participants' rights to withdraw from participation at any time.

If you are conducting research on certain student cohorts, year groups or courses within specific Schools and within the teaching term, permission must be sought from Heads of School or individual academics.

Ethical clearance has been obtained. (Protocol number: H20/02/4)

Research duration: (02-03 Months)

A handwritten signature in black ink that reads "Nicoleen Potgieter".

Nicoleen Potgieter
University Deputy Registrar

CONSISTENCY TABLE

RQ #	Research Question	Hyp. #	Literature-Based Hypothesis	Data Collection Detail	Data Analysis Method	Findings from Own Study	Conclusion Based on Own Study	Key Differences
8	I think my insurance company's data technologies show concern for the privacy of its users.	1.1	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.	Privacy concerns do have a marginally significant impact on customer perceptions.	Privacy concerns do have a significantly marginal impact on customer perceptions.	There is an impact, which is marginally significant.
9	I feel safe when I send personal information through my insurance company's online technologies.	1.2	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.	Privacy concerns do have a marginally significant impact on customer perceptions.	Privacy concerns do have a significantly marginal impact on customer perceptions.	There is an impact, which is marginally significant.
10	I think my insurance company abides by personal data protection laws.	1.3	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.	Privacy concerns do have a marginally significant impact on customer perceptions.	Privacy concerns do have a significantly marginal impact on customer perceptions.	There is an impact, which is marginally significant.
11	I think my insurance company only collects user personal data that are necessary for its activity.	1.4	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.	Privacy concerns do have a marginally significant impact on customer perceptions.	Privacy concerns do have a significantly marginal impact on customer perceptions.	There is an impact, which is marginally significant.

RQ #	Research Question	Hyp. #	Literature-Based Hypothesis	Data Collection Detail	Data Analysis Method	Findings from Own Study	Conclusion Based on Own Study	Key Differences
12	My insurance company does not send e-mail advertising without the user's consent.	1.5	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007)..	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.	Privacy concerns do have a marginally significant impact on customer perceptions.	Privacy concerns do have a significantly marginal impact on customer perceptions.	There is an impact, which is marginally significant.
13	I think my insurance company shows great concern for the security of any transactions.	1.6	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.	Privacy concerns do have a marginally significant impact on customer perceptions.	Privacy concerns do have a significantly marginal impact on customer perceptions.	There is an impact, which is marginally significant.
14	I think my insurance company has sufficient technical capacity to ensure that the data I send will not be intercepted or modified by hackers or third parties.	1.7	Privacy concerns impact customer perceptions (Casaló, Flavián & Guinalú, 2007).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.	Privacy concerns do have a marginally significant impact on customer perceptions.	Privacy concerns do have a significantly marginal impact on customer perceptions.	There is an impact, which is marginally significant.
15	Robots that can make their own decisions and take their own actions.	2.1	Fear of autonomous robots and artificial intelligence impact customer perception Liang & Lee, 2017).	Questionnaire Likert statement 1-5 (Not afraid to Very afraid).	SEM & Correlation Statistics.	Fear of autonomous robots and artificial intelligence does not have an impact on customer perceptions.	Fear of autonomous robots and artificial intelligence does not have an impact on customer perceptions.	There is no impact on customer perception.

RQ #	Research Question	Hyp. #	Literature-Based Hypothesis	Data Collection Detail	Data Analysis Method	Findings from Own Study	Conclusion Based on Own Study	Key Differences
16	Robots replacing people in the workforce.	2.2	Fear of autonomous robots and artificial intelligence impact customer perception Liang & Lee, 2017).	Questionnaire Likert statement 1-5 (Not afraid to Very afraid).	SEM & Correlation Statistics.	Fear of autonomous robots and artificial intelligence does not have an impact on customer perceptions.	Fear of autonomous robots and artificial intelligence does not have an impact on customer perceptions.	There is no impact on customer perception.
17	Artificial Intelligence.	2.3	Fear of autonomous robots and artificial intelligence impact customer perception Liang & Lee, 2017).	Questionnaire Likert statement 1-5 (Not afraid to Very afraid).	SEM & Correlation Statistics.	Fear of autonomous robots and artificial intelligence does not have an impact on customer perceptions.	Fear of autonomous robots and artificial intelligence does not have an impact on customer perceptions.	There is no impact on customer perception.
18	People trusting Artificial Intelligence to do work.	2.4	Fear of autonomous robots and artificial intelligence impact customer perception Liang & Lee, 2017).	Questionnaire Likert statement 1-5 (Not afraid to Very afraid).	SEM & Correlation Statistics.	Fear of autonomous robots and artificial intelligence does not have an impact on customer perceptions.	Fear of autonomous robots and artificial intelligence does not have an impact on customer perceptions.	There is no impact on customer perception.
19	I believe that my insurance company will employ data and online technologies in my best interest.	3.1	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.

RQ #	Research Question	Hyp. #	Literature-Based Hypothesis	Data Collection Detail	Data Analysis Method	Findings from Own Study	Conclusion Based on Own Study	Key Differences
20	If I required help, my insurance company's technological system would do its best to help me.	3.2	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.
21	My insurance company's technological system would be concerned about my well-being, not just its own.	3.3	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.
22	My insurance company's technological system would perform its role of securely storing personal information about citizens very well.	3.4	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.
23	Overall, my insurance company's technological system would be a capable and proficient means for identifying citizens.	3.5	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.

RQ #	Research Question	Hyp. #	Literature-Based Hypothesis	Data Collection Detail	Data Analysis Method	Findings from Own Study	Conclusion Based on Own Study	Key Differences
24	In general, my insurance company's technological system would have sufficient information about citizens.	3.6	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.
25	My insurance company's technological system is trustworthy.	3.7	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.
26	I would characterise my insurance company's technological system as honest.	3.8	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.
27	My insurance company's technological system keeps its commitments.	3.9	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.

RQ #	Research Question	Hyp. #	Literature-Based Hypothesis	Data Collection Detail	Data Analysis Method	Findings from Own Study	Conclusion Based on Own Study	Key Differences
28	My insurance company's technological system is sincere and genuine.	3.10	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.
29	I usually trust a technology until it gives me a reason not to trust it.	3.11	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.
30	I generally give a technology the benefit of the doubt when I first use it.	3.12	Distrust of new technologies impact customer perceptions (Mcknight, Carter, Thatcher & Clay, 2011).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM & Correlation Statistics.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	Distrust of new technologies do have a marginally significant impact on customer perceptions.	There is an impact, which is marginally significant.
31	My insurance company makes an effort to increase my knowledge of the products and services they offer.	4.1	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM.	Customer education and communication does significantly impact customer perception through improved privacy concerns and distrust of new technologies.	Customer education and communication does significantly impact customer perception related to privacy concerns and distrust of new technologies.	There is a significant impact on customer perception through customer education and communication.

RQ #	Research Question	Hyp. #	Literature-Based Hypothesis	Data Collection Detail	Data Analysis Method	Findings from Own Study	Conclusion Based on Own Study	Key Differences
32	My insurance company tries to improve my skills needed to assess the pros and cons of the different services they offer.	4.2	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM.	Customer education and communication does significantly impact customer perception through improved privacy concerns and distrust of new technologies.	Customer education and communication does significantly impact customer perception related to privacy concerns and distrust of new technologies.	There is a significant impact on customer perception through customer education and communication.
33	My insurance company takes the time to provide me with all information I need on their way of doing things.	4.3	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM.	Customer education and communication does significantly impact customer perception through improved privacy concerns and distrust of new technologies.	Customer education and communication does significantly impact customer perception related to privacy concerns and distrust of new technologies.	There is a significant impact on customer perception through customer education and communication.
34	My insurance company gives me all the tools necessary to make informed decisions about the services I buy from them.	4.4	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM.	Customer education and communication does significantly impact customer perception through improved privacy concerns and distrust of new technologies.	Customer education and communication does significantly impact customer perception related to privacy concerns and distrust of new technologies.	There is a significant impact on customer perception through customer education and communication.

RQ #	Research Question	Hyp. #	Literature-Based Hypothesis	Data Collection Detail	Data Analysis Method	Findings from Own Study	Conclusion Based on Own Study	Key Differences
35	My insurance company asks for suggestions and feedback.	4.5	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM.	Customer education and communication does significantly impact customer perception through improved privacy concerns and distrust of new technologies.	Customer education and communication does significantly impact customer perception related to privacy concerns and distrust of new technologies.	There is a significant impact on customer perception through customer education and communication.
36	My insurance company listens to complaints.	4.6	Customer education and transparent communication can positively impact customer perceptions and the relationship to these three concerns (Bell, Auh & Eisingerich, 2017).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree).	SEM.	Customer education and communication does significantly impact customer perception through improved privacy concerns and distrust of new technologies.	Customer education and communication does significantly impact customer perception related to privacy concerns and distrust of new technologies.	There is a significant impact on customer perception through customer education and communication.

RQ #	Research Question	Hyp. #	Literature-Based Hypothesis	Data Collection Detail	Data Analysis Method	Findings from Own Study	Conclusion Based on Own Study	Key Differences
37	I like my insurance company.	1-4	Privacy concerns, fear of autonomous robots and artificial intelligence and distrust of new technology impact customer perception, and this can be impacted by customer education and communication (Vera & Trujillo, 2017).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree)	SEM	Customer perceptions are marginally impacted by privacy concerns and distrust of new technology, and are significantly impacted by customer education and communication	Customer perceptions are marginally impacted by privacy concerns and distrust of new technology, and are significantly impacted by customer education and communication	There is a marginally significant impact on customer perception through improved privacy concerns and distrust of new technologies
38	Next time I need insurance I am going to purchase from this insurance company.	1-4	Privacy concerns, fear of autonomous robots and artificial intelligence and distrust of new technology impact customer perception, and this can be impacted by customer education and communication (Vera & Trujillo, 2017).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree)	SEM & Correlation Statistics	Customer perceptions are marginally impacted by privacy concerns and distrust of new technology, and are significantly impacted by customer education and communication	Customer perceptions are marginally impacted by privacy concerns and distrust of new technology, and are significantly impacted by customer education and communication	There is a marginally significant impact on customer perception through improved privacy concerns and distrust of new technologies

RQ #	Research Question	Hyp. #	Literature-Based Hypothesis	Data Collection Detail	Data Analysis Method	Findings from Own Study	Conclusion Based on Own Study	Key Differences
39	I will recommend this insurance company to my friends and family.	1-4	Privacy concerns, fear of autonomous robots and artificial intelligence and distrust of new technology impact customer perception, and this can be impacted by customer education and communication (Vera & Trujillo, 2017).	Questionnaire Likert statement 1-5 (Strongly disagree to Strongly agree)	SEM & Correlation Statistics	Customer perceptions are marginally impacted by privacy concerns and distrust of new technology, and are significantly impacted by customer education and communication	Customer perceptions are marginally impacted by privacy concerns and distrust of new technology, and are significantly impacted by customer education and communication	There is a marginally significant impact on customer perception through improved privacy concerns and distrust of new technologies