

HOW DOES CONTACT WITH AN ARTIFICIAL INTELLIGENCE AVATAR INFLUENCE CUSTOMER PERCEPTIONS OF BANK SERVICE QUALITY?

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Abstract

Artificial intelligence is thought to improve the efficiency, quality and operations of many organizations. For example, the use of chatbots allows organizations to serve customers 24/7 without the need to hire frontline staff to work around the clock. This thesis investigates how AI, specifically an avatar, influences customers' perceptions regarding the services offered by a bank. Banks are service-oriented and operate in a competitive environment, and therefore customer satisfaction is extremely important. Past research shows that the adoption of AI in the banking industry is increasing, but banks tend to use AI to improve their operations rather than to improve customer satisfaction. Previous studies have also focused on the benefits of AI for banks rather than how AI systems benefit customers. The primary question for this thesis is how does an AI avatar influence customer perceptions of bank service quality and satisfaction levels. The study hypothesized that the use of a virtual assistant would increase bank customers' perception of service quality and level of satisfaction. For this thesis, 60 participants aged between 20 and 60 were recruited at AUT Library in Auckland, New Zealand. Participants were divided into two groups, one group accessed bank services using the ANZ Bank's virtual assistant Jamie, and the other accessed information about bank services online without using Jamie. They were asked to complete rating scale items adapted from the SERVQUAL, and e-SERVQUAL instruments. Hypotheses were tested using t-test and two-way ANOVA. Based on the results, there was no significant difference between a virtual assistant and not using one regarding perceptions of service quality. In addition, there was no significant difference between the group using the virtual assistant and the one that did not regarding perceptions of customer satisfaction. Gender did not influence how customers perceived the quality of bank services or their level of satisfaction. This thesis expands the available literature on the use of AI in banking and whether banks use

of an AI avatar would in fact enhance the quality of their services and increase customer satisfaction. The Technology Acceptance Model (TAM) suggests that customers' intentions to utilize new technologies depend on the perceived ease of use and helpfulness. The thesis bore this out as the participants found Jamie was not simple to interact with and had challenges accessing bank services, which suggests that this technology would not be readily accepted under the TAM model. If banks are seeking to adopt an AI avatar system, they must ensure that customers perceive them as beneficial in terms of service quality and satisfaction. In this study, with this particular avatar system, the results did not bear this out and customer satisfaction and perceptions of service quality may have been put at risk.

Keywords: Artificial Intelligence (AI), Avatar, Virtual Assistant, Banking, Service Quality, Customer Satisfaction

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Attestation of Authorship

“I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning”

Shrooq Alharbi

5th May 2020

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Ethical Approval

Ethics approval was granted on the 28th November 2019 by the Auckland University of Technology Ethics Committee (AUTEC) until the 27th November 2022 (see Appendix A). The ethics application number is 19/455.

Chapter 1: Introduction

1.1 Introduction

Artificial intelligence (AI) is becoming ubiquitous in the traditionally change-resistant banking sector (Santuka, 2019). The introduction of AI in the banking sector could change how some financial services and products are developed, provided, and used. This study seeks to explore how an AI avatar, in the form of an online virtual assistant, influences customer perceptions regarding the services a bank provides. Could the use of an AI avatar increase bank services and satisfaction with those services for banking customers?

This chapter introduces the context of the study by presenting the background and significance of the topic. A background to the study is provided and the problem statement is described, gaps in the current literature, the research objectives, the research question, the significance of the study and its contribution follow. The final section of this chapter describes the organization of the thesis.

1.2 Background

While the banking sector is starting to adopt AI to enhance efficiency and maintain customer gratification, AI has not yet received close attention in the service and marketing literature (Leong et al., 2015). AI was initially defined as the ability of computers to handle tasks at a level equivalent to human intelligence (Copeland, 2019). AI comprises autonomous thinking machines that function independently without requiring human control (Xu et al., 2020).

AI can also be defined as the systems, algorithms, machines and programs that show different aspects of human intelligence and human behavior (Davenport et al., 2019). In the context of customer services, AI has been described “as a technology enabled system

for evaluating real-time service scenarios using data collected from digital and/ or physical sources in order to provide personalized recommendations, alternatives, and solutions to customers' enquiries or problems, even very complex ones" (Xu et al., 2019, p. 1). Haenlein and Kaplan (2019) offer a narrower definition of AI by arguing that it is a system's capability to interpret external data appropriately, learn from this external data, and apply learnings to accomplish certain tasks and goals through flexible adaptation.

Data analytics and machine learning are the primary analytical AI applications (Huang & Rust, 2018). Machine learning can handle tasks, such as speech and image recognition and generate novel data for improved analytics (Davenport & Ronanki, 2018). AI could be defined as any technology applied to mimic advanced and intricate human thinking processes. This technology is extended to include avatars, intelligent virtual assistants and robotic service providers. For example, some banks are experimenting with human-like avatars as an interface with clients. Commonly used AI-based banking applications include chatbots (Santuka, 2019).

AI adoption in the banking sector is increasing. The primary application of AI is its ability to effect customer experience. For example, the adoption of real-time AI-based queuing technology, such as a customer service phone call-back line where the bank will call the customer back rather than have the customer wait on the line to speak to customer service staff, has helped minimize waiting time, thereby reducing time wasted by customers in long queues (Stintzing & Norman, 2017; Rozenes & Cohen, 2017). A reduction in queuing time is one approach to enhancing the client experience in banking.

(Davenport & Ronanki, 2018). Indicate that the use of AI-based applications, such as cognitive technologies to make restaurant and hotel recommendations and solve staff IT issues improves satisfaction level among users. Through online virtual assistants, customers can contact organizations conveniently, an ability that generates value through

convenience, time-saving and increased customer satisfaction (Xu et al., 2010). Provision of customer services through virtual assistants is predictor of customer satisfaction (Xu et al., 2020). According to Stalidis, Karapistolis and Vafeiadis (2015), the use of knowledge-based information systems or intelligent systems helps users solve destination marketing issues. In this case, provision of customer service through AI-based systems, such as online virtual assistants and chatbots might enhance customer satisfaction as they solve pertinent problems.

However, the capacity of AI to enhance the client's experience depends on cultural values, and the willingness and readiness of the customer to embrace automated services and avatars (Ivanov & Webster, 2017). According to Pierdicca et al. (2015), AI creates value for clients by improving interactions and allowing the analysis and management of customer behaviour. For example, using a decision support system or expert systems, management can make more rapid, high quality decisions as AI offers real-time analytics. In a similar way, the use of AI-based chatbots ensures that customers' needs are tailored for, and interactions with bank services enhanced (Riikkinen et al., 2018). Therefore, the creation of value for customers through data management using AI might impact customers' perceptions of the quality of banking services, because it influences the banking experience (Rehman et al., 2016). Specifically, AI contributes to personalized engagement, such as the creation, communication and delivery of personalized offerings to clients (Kumar et al., 2019). For example, an AI-supported service can handle customer communications, reaching into several systems to update important records and even replace lost ATM or credit cards. They might also reconcile a potential failure to charge for a certain service across billing systems through extraction of information from different document types (Davenport & Ronanki 2018). In view of this background, the adoption

of AI in the banking industry may have a significant influence on customers' perceptions of the quality of bank services.

1.3 Problem Statement

Banks are experiencing difficulties in attracting new customers in the challenging contemporary business environment (Castelli, Manzoni & Popovič, 2016). It is thus necessary to continue to satisfy existing customers to enhance customer loyalty, bolster the bank's credibility and avoid potential customer attrition (Castelli, Manzoni & Popovič, 2016). Achieving these goals is very important in an industry where most competitors can provide similar services, prompting a high level of competition (Castelli et al., 2016). In such circumstances, the quality of services offered to customers is critical.

Banks however face the challenge of balancing great customer service with cost minimization goals. The adoption of AI avatars by banks might thus be meant to serve two functions that are otherwise hard to achieve: service improvement and reduction in the cost of operation. Understanding the influence of an AI avatar on customers' perceptions of the quality of the services offered is thus very important. There is currently little research to confirm whether well-implemented AI interfaces can make customers feel that they have received higher quality services (Daqar & Smoudy, 2019).

1.3.1 Gaps in the literature

While a growing literature is available regarding the impact of AI on service businesses generally, the banking sector has received little attention. Extant research appears to explore the benefits of AI to the bank rather than to its customers (Jaksic & Marinc, 2015). For example, a recent study indicates that AI can improve certain metrics in banking, such as communication, automation, and decision making (Jaksic & Marinc, 2015). Researchers tend to pay attention to the application of AI in decision-making

processes such as its use to support credit approval, and fraud and bankruptcy prediction (Moro, Cortez & Rita, 2015). However, research has not focused extensively on the benefits of this technology to bank customers themselves, and quality of service.

There is also a gap in research regarding the use of AI avatars in the banking industry. Studies have tended to focus on related technologies such as machine learning (ML) and big data. For example, ML and big data are powerful tools utilized by financial firms to change how financial products and services are developed and offered (Jagtiani et al., 2018). It appears that there is no current research on the impact of AI avatars on customers' perceptions of the quality of banking services.

1.4 Research Objectives

The overall purpose of this study is to examine the relationship between AI avatars and customer perceptions of bank service quality.

The specific research objectives are:

- To investigate the impact of an AI avatar on customers' perceptions of bank service quality
- To determine whether an AI avatar increases the ease of accessing and offering bank services

1.5 Research Question and Hypotheses

***Q1:** How does an artificial intelligence avatar influence customer perceptions regarding the quality of services a bank offers?*

H1: Use of an AI virtual assistant will enhance bank customers' perceptions of service quality.

H2: Use of an AI virtual assistant will enhance bank customers' levels of satisfaction.

To assess perceptions of service quality the SERVQUAL and e-SERVQUAL tools are used in this study. The SERVQUAL tool is used widely to assess the quality of services in many industries, which in this case helps to measure customer satisfaction with banking services (Pakurár et al., 2019). The e-SERVQUAL instrument is parallel to SERVQUAL but is used to measure and assess customer perceptions of digital and online services. These dimensions are imperative in banking as customers consider service quality important when choosing a bank (Javed et al., 2018).

Theories that will underpin the study are the Technology Acceptance Model (TAM) and Role Theory. The TAM suggests that a customer's decision to use novel technologies is influenced by the customer's perception of the technology's helpfulness and ease of use, so the TAM is applied to the novel technology in this study (Wirtz et al., 2018). It has been found that resistance to AI reduces when the services it provides are personalized and AI systems are used for decision-making support rather than making decisions on its own (Longoni, Bonezzi & Morewedge, 2019). According to role theory, people are accustomed to interacting with socially developed roles as a way to ensure they understand each other (Wirtz et al., 2018). AI-based tools, such as virtual assistants, might be more acceptable and provide better service to customers if they comply with socially-accepted norms.

1.6 Significance and Expected Contribution of the Study

Virtual assistants are available in multiple forms and have already been adopted in the banking industry. For instance, ERICA is a virtual voice assistant for the Bank of America (<https://promo.bankofamerica.com/erica/>), which can help bank clients confirm

their balances, remind them to pay their bills, and answer bank-related inquiries (Robert, 2018). This thesis aims to show that the adoption of an online AI avatar in the banking industry can improve the quality of service delivery and help banks reduce costs. This thesis will contribute to the existing body of research regarding the need, role and benefit of AI virtual assistants in the provision of bank services.

1.7 Organization of Thesis

The thesis is composed of five chapters. Chapter 1 is an introduction to the background of the study, the problem statement, the specific objectives of the research, the research question, and the significance of the study. In Chapter 2, a literature review links the concepts of AI avatars, bank services, service quality, and customer perceptions. Chapter 3 elaborates on the research design used to test the hypotheses. This section presents the study design, subjects, sampling method, questionnaire development, and the data collection and analysis methods. Chapter 4 presents the study's empirical results. The chapter discusses the results obtained using different analysis tools, including exploratory factor analysis, reliability analysis, t-tests and ANOVA. Chapter 5 is a discussion of the implications of the results, the theoretical contribution, managerial implications, limitations and possible directions for future research.

Chapter 2: Literature Review

2.1 Introduction

This review will look at definitions of AI and how it influences the service sector. The review will then focus on the tools used to measure service quality, including e-SERVQUAL and SERVQUAL measures. This chapter will also outline research gaps that have been identified regarding the use of AI avatars in the banking sector.

2.2 Background

AI virtual assistant systems have been extensively adopted for commercial use, but their impact on bank services has not been studied comprehensively (Fethi & Pasiouras, 2010). AI has been widely adopted by some leading banks, such as Bank of America and American Express, to increase the efficiency of services and improve customer satisfaction (Leong et al., 2015), and chatbots have become important AI applications in banking, such as Amex by American Express and Erica by Bank of America (Santuka, 2019; Hales, 2019). These studies agree that AI is important to banking but do not agree on how AI should be implemented. AI-based interfaces create value for customers by offering real-time interactions, rapid access to services, and the elimination of wait time at a bank branch. Importantly, the use of AI virtual assistant systems in banking has a considerable influence on the perception of customers regarding the quality of bank services (Rehman et al., 2016). In view of the level of competition in the banking sector, banks need to prevent customer attrition through the provision of high-quality service. Castelli et al. (2016) observe that most banks can offer similar services, which means that the level of competition is intense in the banking sector. Even though these studies present different positions regarding the application of AI, they each assert that AI can increase a bank's competitive advantage.

The conceptual framework for this thesis (Figure 2.1) will look at whether the use of a virtual assistant may influence customers' perception of service quality and satisfaction with a bank as opposed to not using such an assistant. Customers' intentions to utilize new technologies depend on the perceived ease of use and the helpfulness of the technology according to the Technology Acceptance Model which is an information systems theory (Wirtz et al., 2018). Apart from providing core services, new technologies should also provide relational and social-emotional elements to attract customers (Wirtz et al., 2018). For example, MSC Cruises have developed a virtual assistant called Zoe that offers information about onboard services, answers questions about the cruise, helps customers book services and provides guidance and suggestions (MSC Cruises, 2019). Zoe offers relational and socio-emotional satisfaction through efficient customer interaction, provision of suggestions to ensure customers do not waste time and the prompt answering of customers queries. Role theory can also help predict how a customer evaluates the services offered by a virtual assistant. In this case, a role is a collection of cultural, social, and functional norms that govern how parties or individuals should act in different situations in their interactions (Giebelhausen et al., 2014). Role theory asserts that individuals or parties need to act in line with socially developed roles for each individual to understand the other (Wirtz et al., 2018). For example, an intelligent virtual assistant should meet the functional, relational and social-emotional needs of consumers in order for the consumer to understand and be able to relate to the virtual assistant (can you give an example of this happening or not happening) (Wirtz et al., 2018).

The independent variable for this thesis is the use or non-use of a virtual assistant to access banking services while the dependent variable is customer perception of service quality and satisfaction, with gender being the moderator. The role of gender as a moderator is to determine whether the perceptions of males and females are different

regarding the quality of bank services, but the scope of this thesis is not investigating whether men and women differ in their acceptance of virtual assistants. A moderator is significant because it can heighten or diminish the relationship between the dependent and independent variable (Ben-Eliyahu, 2016). In banking, women and men are likely to have different perceptions of service quality, for example, Zalatar (2012) found that gender affects customers' perceptions and expectations of bank service quality in commercial banks in the Philippines. However, another study suggested that gender might not impact customer perceptions of quality in all banks. Ahmad et al. (2010) indicate that gender influences customers' perception of bank service quality in Islamic banks but not conventional Western-style banks. Hence, gender as a moderator will help determine whether men and women have different perceptions regarding bank service quality.

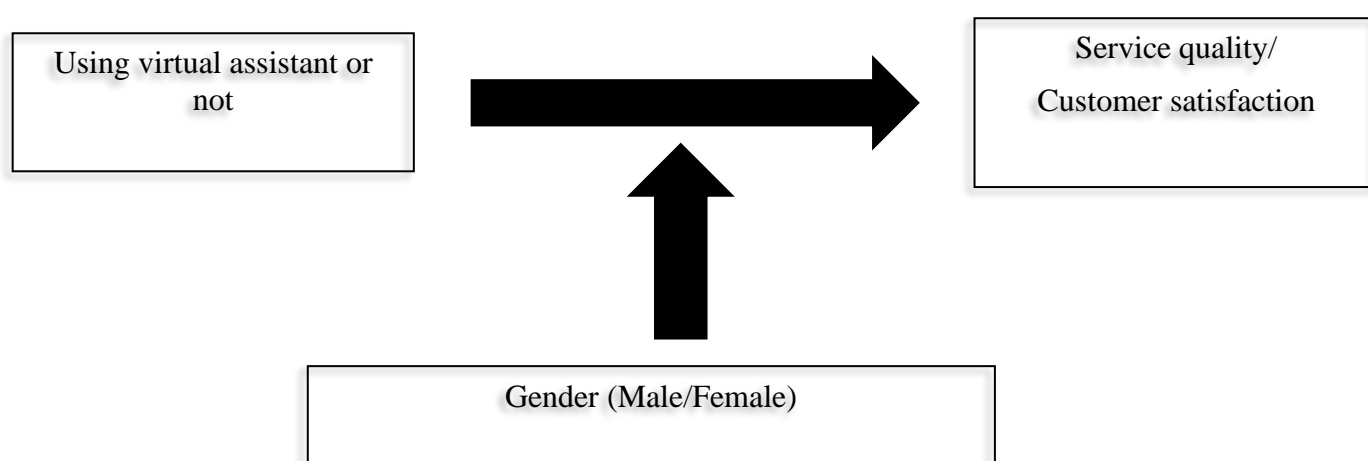


Figure 2.1 Conceptual framework of the thesis

2.3 Artificial Intelligence (AI)

Table 1 shows several definitions of AI that have been used in the literature. The definitions emphasise the ability of AI act intelligently and use data to assist in decision making (Paschen et al., 2019; Martínez-López & Casillas, 2013). Haenlein and Kaplan's (2019) definition of AI has been adopted for use throughout this research. Therefore, AI

is a system which can analyse external data, learn from it, and use what I has learned to complete tasks and goals while adapting (Haenlein & Kaplan, 2019).

Table 2-1 Definitions of Artificial Intelligence from the Literature

Definition of AI	References
Computational agents acting intelligently	Paschen, Kietzmann & Kietzman 2019
Systems with strengths and potentialities to support decision making situations faced by firms	Martínez-López & Casillas, 2013
AI comprised several building blocks, including natural language processing image recognition, problem solving and reasoning, machine learning and speech recognition	Kietzmann, Paschen, Treen (2018)
A system's capability to interpret external data appropriately learn from this external data, and apply those learnings to accomplish certain tasks, goals through flexible adaptation	Haenlein & Kaplan, 2019
Tool for retrieving and analysing enormous data, which improves the complex process of solving problems	Jarrahi, 2018

Systems that can argument human self-expression since they eliminate barriers, like the lack of production skills	Fox, 2018
Intelligent machine that enable humans to handle superior tasks in a fulfilling manner	Davenport & Kirby, 2015

Despite the wide adoption of AI in various industries, its adoption and use in banking remains largely unstudied. AI refers to technology which has human-like reactions and can make human-like judgments when exposed to various stimuli (Shubhendu & Vijay, 2013, as cited in West, 2018). Even though this definition may be widely accepted, there is a lack of a uniformly accepted definition of AI (West, 2018). According to Mata et al. (2018), AI systems and entities can perform operations that require decision making and learning. These systems and entities imitate biological processes and have human-like cognitive capabilities. Conceptually, West (2018) and Mata et al. (2018), present similar positions regarding the abilities of AI. Shubhendu and Vijay (2013) assert that AI comprises software systems that make decisions which need human-level expertise and assist humans in dealing with current issues or predicting future problems.

The origin of the AI concept is ascribed to Alan Turing (West, 2018), who in 1950, anticipated that thinking machines that could reason like human beings would emerge (West, 2018). Turing believed that machines could be created to think just like humans. John McCarthy is the first person who coined the word “artificial intelligence” in 1956 to describe devices that have the capacity to think autonomously (Shubhendu & Vijay, 2013). It is interesting that scientists do not generally agree on what constitutes AI, as there is disagreement about definitions of “intelligence,” “thinking,” and “fully autonomous”

(West, 2018). Scientists do not agree on the exact definition of AI, but agree that AI has human-like attributes.

Currently, AI is used in many different industries including the banking and retail sectors (Li & Du, 2017). In the retail sector, AI virtual assistants offer virtual shopping capability and even provide personalized recommendations and purchase options to customers. Fethi and Pasiouras (2010), note that AI technology has also been used to improve stock management and on-site retail layout. AI is used in banking to enhance the precision, speed, and the effectiveness of human efforts and thereby reduce errors (Erdal & Ekinici, 2013; Fethi & Pasiouras, 2010). For example, AI systems can minimize errors such as crediting or debiting the wrong accounts. Copeland (2019) suggests that AI could be used in financial institutions to identify fraudulent transactions, establish a fast and accurate credit rating, and ensure automatic management of massive data.

AI operates in an intelligent, adaptive, and intentional manner (West & Allen, 2018). With regards to intelligence, AI relies on data analytics to perform different functions, for example, machine learning (ML) analyses data to identify underlying trends in order to come to a decision. Adaptability refers to the ability of AI systems to adapt and learn when making decisions (West & Allen, 2018). For example, in the transportation industry, semi-autonomous cars are equipped with tools that enable the vehicle to recognize highway construction, potholes, congestion, and other impediments to traffic and adjust accordingly (West & Allen, 2018). Intentionality means that AI algorithms are created to make decisions, mainly utilizing real-time data, an example of which is Siri by Apple which receives and interprets voice data in real-time (West & Allen, 2018; Kaplan & Haenlein, 2019).

This ability to make decisions is what makes it different from passive machines that act based on predetermined responses. AI algorithms use remote inputs, digital data,

or sensors to merge information from diverse sources, evaluate the information almost instantly, and act based on the information gained. The processing speed, analytical abilities, and storage abilities of AI systems have greatly improved over time, giving them the ability to make more sophisticated decisions (West & Allen, 2018).

AI operates in four primary ways: automated intelligence, assisted intelligence, augmented intelligence, and autonomous intelligence (Price Waterhouse Coopers, 2017). Automated intelligence involves the automation of manual tasks and routine tasks, while assisted intelligence entails the use of AI systems to help humans to complete tasks faster and better (Price Waterhouse Coopers, 2017). West (2018) explains this as AI analysing information in a way that helps humans to perform at higher levels or augments human analysis. Augmented intelligence involves the use of AI systems to help humans to make appropriate decisions. By contrast, autonomous intelligence entails the total automation of the decision-making processes without intervention from humans (Price Waterhouse Coopers, 2017). For example, digital assistants can schedule appointments without human intervention (West, 2018). Both Price Waterhouse Coopers (2017) and West (2018) point to the ability of AI to make appropriate decisions.

Automation of customer services through AI can generate customer satisfaction (Pasquale, Bushey & Knott, 2011). As an example, Mastercard has integrated AI into its payment system to enhance customer experience and satisfaction by offering suggestions and accepting payments (Choudhury, 2016). Compared to the use of an AI-based system, hiring and retaining staff to offer customer services is costly. Due to attrition, an organization faces the same costs of recruiting staff over and over again (Fleming & Asplund, 2007). Localizing customer services can also be highly complex and expensive (DeSmet, Lund & Schnainger, 2016). AI can eliminate these problems because AI tools can be easily reconfigured, enabling the software to handle the mundane and regular tasks

while staff address customer needs that are more multifaceted and complex (Brunette, Flemmer & Flemmer, 2009). In addition, AI can quickly draw on the massive information warehouse that exists within an organization, and use it to address repetitive questions (Keim, 2010). DeSmet et al. (2016) and Keim (2010) both note that AI can analyse huge amounts of data to make decisions with which to handle mundane tasks. For example, AI-based chatbots are created from instant messaging, personal interaction and natural language processing (Zumstein & Hundertmark, 2017). A chatbot refers to a computer program used for conducting conversations via textual or auditory methods. Retail stores and banks use chatbots to provide better customer service as they enable fast resolution to problems and queries which is associated with a high level of customer satisfaction (Okuda & Shoda, 2018; Vieira & Seghal, 2018).

AI offers advantages in effectiveness and efficiency in the Customer Care Centre (CCC) process. The goals of using digital agents (AI) in CCC processes are better customer service, wait time reduction, and efficient transactions, as well as support, and work planning (Radziwill & Benton, 2017). Lavierre et al. (2017) suggest simple tasks are accomplished by the chatbots; for example, providing the first line of contact with customers and answering easy, frequently asked questions. Chatbots request pertinent and essential information from the customer, such as customer number and email address, and then proceeds to prepare the required information (Cohen, 2018). This enables the human employee to efficiently pick up the request.

Despite the advancements in AI, existing AI systems are limited to certain intellectual spheres such as dialogue responses, and speech and image recognition (Lu et al., 2018). AI is yet unable to mimic or display all the functions of the human brain, such as self-control, self-motivation, self-consciousness, and self-understanding (Lu et al., 2018). Rather than offering entirely autonomous systems, AI adds reasoning and

knowledge to existing databases, environments, and applications, to make them smarter and user-friendlier (Mata et al., 2018). Lu et al. (2018) and Mata et al. (2018) agree that AI can mimic humans but disagree on the exact human features that AI can mimic.

AI-based virtual assistance is not a perfect system, as the model works only when the needs of a customer are well understood or have been encountered before. It is not possible for an AI application to run an entire customer service system of a bank (Davila, Epstein, & Shelton, 2012). In one study, Demirkan and Delen (2013) suggest that organizations such as banks and retail service providers need to start building repositories for data, processes and mechanisms that can assist AI models to learn rapidly. Equally, the organizations should build a workflow that allows complaints and complex queries to come to human service agents before interactions with the chatbots (Varian, 2018). In this case, Demirkan and Delen (2013) and Varian (2018) have similar thoughts on how AI streamlines workflow.

2.3.1 Impact of artificial intelligence on the service industry and service quality

Recent studies have attempted to understand the impact of AI in services. AI is increasingly used in the service industry and is becoming an essential part of contemporary innovation (Huang & Rust, 2018) as it handles various service tasks. As highlighted by Yip and Bocken (2018), today, most financial institutions acknowledge the importance of digitizing their services. Reducing human interactions can make banks more efficient in terms of service speed, cost, and sustainability (Li & Du, 2017). According to Madan et al. (2015), financial institutions should focus on generating commitment and trust between the bank and its customers and clients in order to create long-term relationships. AI systems, such as virtual assistants, ensure that customer queries are handled quickly, which might enhance the client's experience and estimation of service quality (Cui et al.,

2017). Chu, Lee, and Chao (2012) assert that customer satisfaction is achieved by providing high-quality services. Hence, there is a need for banking institutions to prioritize their customers to guarantee high levels of satisfaction and thereby retain their customer base (Chen, 2013).

Intelligent chatbots or virtual chatbots have become widespread in the service industry and are increasingly replacing human customer service (Fluss, 2017). Virtual chatbots make self-service possible eliminating the need for employees. Chatbots can enable financial institutions to identify customers' problems and provide the most appropriate solutions. A digital human assistant named Cora has been created by NatWest Bank in the UK, using the technology provided by Soul Machines, a company based in New Zealand (PYMNTS, 2018). This is a text-based chatbot designed to answer customers' questions on the online help pages of the bank. It can answer 200 basic banking queries and handling 100,000 chats per month. NatWest Bank is now engaged in several digital developments, such as Mettle, and a new version of Cora, using AI. The new prototype Cora enables a two-way verbal conversation with customers through a computer screen, mobile phone, or tablet (Samuels, 2019). Other institutions also use chatbots, for example, the Auckland Airport has deployed Vai (Virtual Assistant Interface), a 'digital' biosecurity officer, which saves human officers time and handle the most important issues by answering the questions of passengers arriving at the biosecurity area of the airport (Paredes, 2019). . Other organisations include Air New Zealand, which introduced 'Sophie' a trial AI virtual assistant in 2018, used for its global marketing campaign. However, Air New Zealand's first foray into AI was Oscar, an online chatbot used for assisting customers with their general queries (Paredes, 2019) According to Maskey (2018), analysts have estimated that banking institutions that adopt AI will save over US \$1 trillion by 2030, by improving their service quality leading to improved customer

satisfaction. Thus, cost saving is a major benefit that financial institutions are likely to enjoy as a result of adopting AI. ANZ Bank is one such institution that is using digital assistants, such as chatbots, to handle common client queries (Paredes, 2019)

Intelligent chatbots operate on fast virtual servers, which provide a lot of processing power to meet clients' needs (Fluss, 2017). The integration of machine learning with the virtual assistant interface produces innovative results for customers. This integration is being applied in many enterprises' contact centres or customer service departments (Fluss, 2017). What is interesting is that both financial and non-financial benefits influence the adoption of AI in the service industry. Labour cost saving is the primary financial benefit of adopting AI virtual assistants and related technologies. Self-service applications, chatbots, and service avatars can work 24/7, much longer than the regular 40 hours per week for human workers (Ivanov & Webster, 2017). Chatbots can also serve many clients concurrently, which is impossible for human workers. Considering these factors, AI and related technologies are thought to be more efficient in performing tasks than human employees (Ivanov & Webster, 2017). West (2018) observes that AI may be able to perform complex tasks that might not be able to be handled by humans.

AI and its related technologies have also been associated with numerous non-financial benefits. According to Kuo, Chen, and Tseng (2017), AI, service automation, and avatars, might improve the perception of service quality through interactive and attractive ways of engaging and communicating with customers. AI might also be beneficial to customers because it introduces more interactive methods of service delivery. Chatbots and avatars may be programmed to communicate in several languages which would eliminate language barriers that might be experienced if staff can only communicate in a single language (Ivanov & Webster, 2017). AI, service automation, and avatars can generate value for clients by making the delivery of services entertaining and funny

(Chtourou & Souiden, 2010). AI and related technologies can also save workers' time because they will not be required to handle repetitive and tedious tasks. (unless you can relate that to improved customer service and satisfaction, you don't need this) Service quality can also improve because AI systems never lose their temper and remain calm even when a customer becomes abusive, aggressive or angry (Dignum, 2017).

2.3.2 Application of artificial intelligence in banking

Even though the banking sector is adopting AI, its impact on bank services is unclear. ABSA the South African financial services group's Regional Operations (ARO) is using a conversation-capable AI known as KIA to offer an efficient digital banking experience to its customers (Business Insider, 2017). Further, ASB Bank has personalized conversations with its customers with IBM Watson, an AI question-answering system which can answer questions asked in natural language for tailoring and automating marketing (O'Neill, 2018). AI is increasingly being adopted in banking across the world, with Anurag (2019), stating that AI has improved customer banking experience through the use of chatbots which allows customers to access banking services 24/7 without delays. AI is also providing convenience in the management of customer data in the banking sector (Anurag, 2019). The synthesis of data through AI helps banks to understand and serve customers better (Buechler, 2019). Furthermore, AI allows banks to offer services by email, phone and computer, and allows access to legal documents. AI technology is also helping banks to solve intricate problems such as money laundering (Anurag, 2019).

Banks and investment banking are increasing their investment in AI to leverage the benefits of this technology. For example, investment in financial AI in the US from 2013 to 2014 increased to almost \$12.2 billion (West & Allen, 2018). Banks are using AI technologies to make decisions about the provision of loans. AI systems can, through the use of artificial neural networks, analyze the data of a borrower to make decisions about who

should be granted a loan rather than relying on background checks and credit scores alone (West & Allen, 2018; Eletter, Yaseen & Elrefae, 2010).). The use of AI technologies in loan analysis helps to minimize human emotional bias that can affect the process of a loan application. The use of AI to determine individuals who qualify for loans can produce more reliable information than credit scores (West & Allen, 2018). Therefore, AI can minimize the cost of processing loans and minimize personal judgment, so improving customer service quality (Eletter et al., 2010). Eletter et al. (2010) further note that AI systems help banks evaluate personal credit to minimize the risk of defaulters. Investment banking is also using AI to develop personalized investment portfolios, which obviates the need for financial advisers and stockbrokers. West and Allen (2018) note that advances in the application of AI in investment banking are making it possible to eliminate human emotion in investing to make decisions that are grounded solely in analytical considerations in a few minutes.

According to Ivanov, Webster and Berezina (2017), MasterCard is using AI to improve payments and customer experience. MasterCard partnered with Pizza Hut to place ‘Pepper’ in the restaurant’s outlets across Asia. Pepper is an AI based robot assistant created by SoftBank Robotics and is equipped with human-like reactions and abilities. The robot can chat with clients, make suggestions, accept orders, and accept payments that are made using MasterPass, MasterCard’s digital payment service (Ivanov et al., 2017). Pepper offers customers a more personalized shopping experience than is currently offered by self-service kiosks and machines (Ivanov et al., 2017). Apart from offering these services, Pepper can discern basic human emotions such as anger, sadness, and surprise. The robot assistant can detect non-verbal cues such as head tilting, intonation, and contexts behind on both verbal and non-verbal cues, just as a human would (Choudhury, 2016). MasterCard (2018) seeks to make payments simple and convenient for customers using Pepper.

The application of AI, such as virtual assistants, in retail banks may help to create personalized experiences for clients. In addition to this, retail banks that provide services to personal customers and small businesses can provide an omnichannel experience with the help of AI (Buechler, 2019). An omnichannel experience is, in the retail sector for example, one where customers can shop in physical stores, or through their phones, tablets or PCs; seamlessly making contact with the retail brand easier for the customer (Buechler, 2019). MasterCard (2018) allows customers to pay through both chatbots and digital voice assistants, in addition to the option of using the website as a way of replicating the retail omnichannel experience. Both MasterCard (2018) and Buechler (2019) indicate that AI can be used in this way to improve customer access.

Data analysis is another way in which banks can benefit from AI. Banks collect and store a lot of customer and industry data that is of no use without proper analysis. Banks can now also collect data through chatbots (Zumstein & Hundertmark, 2017) and AI allows banks to analyse data efficiently and generate essential insights in real-time, allowing for the delivery of personalized customer services. For example, AI helps Wells Fargo Bank to personalize services for millions of people who use the bank's services, by providing personalized account and financial insights (Buechler, 2019).

Organizations such as banks use the data, synthesized using AI, to understand their clients and which are their most requested bank services (Buechler, 2019). Banks understand customers from different perspectives through the data analysed using AI, understanding when a customer makes a deposit, withdrawal or interacts with other services (Zumstein & Hundertmark, 2017). The organizations can use the data to predict customer needs and offer appropriate services, making the lives of the customer easier. Applying AI can improve customer relationships for even large enterprises with hundreds of thousands of customers as they can deliver hyper-personalized experiences in real-time

(Buechler, 2019). For example, MasterCard wants to ensure customers receive highly-personalized services through its AI applications; for example Mastercard's AI system offers suggestions (of services that customers may not be aware of that would fit their profile) to customers when they are using their services (MasterCard, 2018). Thus, AI is beneficial to banks because it helps organizations predict what customers may want, and they can then deliver appropriate services in a timely manner.

2.3.3 Artificial intelligence and customer satisfaction

There is scant information about the effect of AI on customer satisfaction in banking. Advanced AI-based technologies such as Google's Google Assistant, Amazon's Alexa, and Apple's Siri are well known (Brill, Munoz & Miller, 2019). AI is increasingly used to develop virtual assistants in different industries to perform both basic and advanced tasks, but the applicability and functionality of virtual assistants varies (Brill et al., 2019). The application of AI is influenced by its adaptability or the ability to 'learn' (West, 2018).

Recent research by Brill et al. (2019) showed that the use of AI digital assistants has a positive impact on customer satisfaction, and, according to Okoro (2014), customer satisfaction is important in creating loyalty. Customers have varying expectations when using a service and AI digital assistants can be successful in meeting these expectations (Brill et al., 2019). For Okoro (2014) AI can enhance customer satisfaction, while Brill et al. (2019) bring a contrasting argument that AI merely meets customer expectations.

The use of chatbots helps service providers to collect users' data which may even include the behaviour of customers. Omale (2019) asserts that AI can accelerate the process of understanding customers. Through the collected data, companies understand the demographics of their customers and the preferences of these customers in new ways, such as discovering customer interests and purchase history (Zumstein & Hundertmark,

2017). AI can collect, synthesize and store the entire history of a customer, which provides better understanding (Thiel, 2018). Better understanding of customers is important in providing a quality customer experience. Hence, companies can offer improved customer experience through AI, which results in enhanced customer satisfaction and loyalty (Omale, 2019). For example, the data collected through AI chatbots can help companies to understand customer profiles, responses, and interests (Zumstein & Hundertmark, 2017). Chatbots also eliminate errors and delays in customer service, which trigger dissatisfaction and frustration (Thiel, 2018). Most organizations have the goal of increasing customer satisfaction and loyalty. As argued by Thiel (2018) and Zumstein & Hundertmark (2017) AI plays a vital role in helping organizations to automate their response to customers.

Users can link their profiles to chatbots allowing AI to collect their personal information. On the other hand, chatbots can also collect user information through the questions that customers answer while seeking services (Zumstein & Hundertmark, 2017). Chatbots can store information such as a user's request, buying history, and other relevant information. Chatbots use the information to offer an immediate personalized response (Thiel, 2018). Once this information is collected, companies can offer customized services to their customers. Chatbots enable customers to connect with service providers conveniently without the restrictions of time zones, waiting time, opening hours and language, especially for customers who purchase items from other countries (Zumstein & Hundertmark, 2017). Omale (2019) adds that certain AI technologies like natural-language processing, natural-language understanding, and machine learning can assist companies in appraising customer feedback on a large scale, with speed and precision that cannot be achieved by humans.

In terms of the provision of customer services, AI solutions allow firms to produce highly personalized responses for each individual customer (Omale, 2019). Humans cannot generate a large number of personalized messages simultaneously because they are unable to collect and memorize a customer's entire history (Thiel, 2018). Another benefit of chatbots is that they allow customers to have one-to-one communication. The lack of AI-powered chatbots causes customers to search on a website for a long time to get appropriate information such as contact details, products, prices, or services offered by a specific company. Chatbots are efficient, straightforward, and beneficial in handling customer inquiries and complaints (Zumstein & Hundertmark, 2017). Chatbots are programmed to respond to all customers in a friendly manner, enabling them to offer suitable services or solutions in a timely manner.

Generally, customers' willingness to use a virtual assistant depends on the ability of the avatar to provide the required service and satisfy relational and social-emotional needs (Wirtz et al., 2018). Customization and intelligent prediction through AI causes customers to feel as if each product is designed to satisfy their specific needs (Thiel, 2018). Customers will experience a high level of satisfaction if the AI-powered solution is programmed to offer excellent services and establish a relational connection.

In the insurance industry, AI is used to enhance communication between customers and insurance companies. AI-powered service chatbots can be useful in informing clients about available offers, recommending the best offers, and offering post-sale services (Shankar, 2019). According to Thiel (2018), AI has the potential to make personalized recommendations. AI allows for the automation of asking simple questions, and completing simple and repetitive tasks (Shankar, 2019). Nevertheless, AI technologies might be unable to handle complex tasks within the insurance industry, meaning that humans would still need to be employed to handle specific claims. The gap regarding the

use of AI in banking is that banks use AI systems to improve their efficiency and operations, such as in the process of identifying customers who qualify for loans, rather than using AI to increase customer satisfaction (West & Allen, 2018). However little research has gone into assessing the how AI affects customers' perceptions of the quality of service banks provide and how this in turn affects customer satisfaction with their bank. This thesis investigates the relationship between the use of an AI avatar and service quality because this has the potential to influence customers' satisfaction, which in turn has an effect on customer retention and loyalty.

Several service quality conceptualization models, such as e-SERVQUAL and SERVQUAL, can be used by the banking sector to determine the quality of their services.

2.4 SERVQUAL Model

Currently, banks strive to meet multiple customer needs to realize sustainable development. The SERVQUAL model is widely used to measure the quality of services, thus determining the level of customer satisfaction in banking (Pakurár et al., 2019). Parasuraman et al. (1988) created the SERVQUAL model to assess service quality, and the model consists of five dimensions, being “tangibles, reliability, responsiveness, assurance, and empathy.” The attributes of the SERVQUAL model suggest that services are likely to be delivered through standard criteria. In this case, the five dimensions of the SERVQUAL model can always be used to measure service quality over different industries. For instance, Yarimoglu (2015) indicates that the five dimensions have been used to measure service quality in settings as varied as repair and maintenance, banking, telephone, and credit card services.

Each dimension of the SERVQUAL model assesses a different element of the service. Tangibility focuses on personnel appearance, equipment, and physical facilities (Chingang Nde & Lukong, 2010). Reliability measures the capacity to deliver the

promised service accurately and dependably (Parasuraman et al. 1998). Responsiveness involves the willingness to assist a customer and offer prompt services, while assurance involves the courtesy and knowledge of workers and their ability to cultivate confidence and trust (Chingang Nde & Lukong, 2010). Lastly, empathy focuses on the individualized attention that customers receive from a company (Parasuraman et al., 1998).

The SERVQUAL framework was primarily created for retail and service businesses and had the goal of evaluating how a customer rates a service provided by a business (Parasuraman et al., 1988). Evaluating how customers rate the services provided is vital for profitability and growth. A company can use the SERVQUAL framework several times a year to determine the quality of its services. The model can be used up to four times a year at different times to determine whether there are differences between the actual and perceived services (Parasuraman et al., 1988). The SERVQUAL model can be used together with other measures of service quality.

Despite the wide application of the SERVQUAL model, it has been criticized (Chingang Nde & Lukong, 2010). Critics argue that the model is not grounded in a well-known psychological, economic, or statistical theory (Chingang Nde & Lukong, 2010), and that model has operational and theoretical weaknesses (Shahin, 2004). Additionally, the model pays attention to the delivery of services and does not consider the outcome of the offered services. Due to this gap, SERVQUAL is just one of many frameworks for determining service quality (Shahin, 2004). There is also a notion that the five dimensions of the SERVQUAL model are not ubiquitous, and the dimensions are too closely related (Chingang Nde & Lukong, 2010). Due to these factors, critics believe that the model is not well-suited to assess service quality.

The SERVQUAL model has been used to measure service quality in different businesses in the service industry. Kumar, Kee, and Manshor (2009) applied the model to

investigate the most important factors in offering quality services in Malaysian banks. However, the authors modified the model to suit their study and context. The results showed that reliability and tangibility are critical in the delivery of quality bank services (Kumar et al., 2009). Kumar et al. (2009) suggested that banks should enhance their competence in delivering services and meeting the assurance of clients. Banks should also provide their services at the convenience of the customers. Overall, Kumar et al. (2009) suggests that the SERVQUAL framework has proved effective in determining customers' perceptions regarding the services offered by banks.

2.5 e-SERVQUAL Measure

The e-SERVQUAL measure is widely used to assess and qualify e-services across different industries. E-service is any type of customer service that is delivered through the Internet and involves an interaction between customers and internet-based service providers (Javed, Rashidin & Li, 2018). E-service quality is the way in which customers evaluate and judge the service provided through the internet (Javed et al., 2018). The e-SERVQUAL measure is helpful in assessing how customers judge e-services and their corresponding level of satisfaction. Online channels and traditional brick-and-mortar enterprises are very different, making it necessary to use different instruments to measure service quality. In accordance with Moon (2013), e-SERVQUAL is seen to be the extent to which a certain website facilitates effective and efficient shopping, purchasing, and delivery. e-SERVQUAL was specifically developed to determine customers' perceptions regarding the quality of e-services.

According to Nemati et al. (2012), the e-SERVQUAL measure comprises seven dimensions: responsiveness, privacy, fulfilment, efficiency, reliability, contact, and compensation. e-SERVQUAL has been used widely to assess the quality of banking services. Javed et al. (2018) used e-SERVQUAL to evaluate the difference between the e-

services of local and foreign commercial banks in Pakistan and identify the dimensions of e-SERVQUAL that are important for online banking. The authors found that privacy and reliability were the most important dimensions of e-service quality (Javed et al., 2018). Javed et al. (2018) conclude that banks need to pay more attention to reliability and privacy because they are essential for decision-making in online banking.

The seven dimensions of e-SERVQUAL are grouped into two classes, which are the core service scale and the recovery scale (Zavereh et al., 2012). The core service scale consists of four dimensions, while the recovery scale has three (Nemati et al., 2012). The core service scale focuses on the core characteristics of the website being; efficiency, fulfilment, reliability, and privacy (Zavereh et al., 2012). Efficiency is the ability of clients to access a website, and find a suitable information or product, while fulfilment entails the accuracy of services, availability of products and timely delivery of the products (Nemati et al., 2012). Reliability involves the technical functionality of a website, especially the extent to which a site is available and functions properly (Nemati et al., 2012). According to Nupur (2010), e-banking can enable banks to offer swift, valid, and reliable services to clients, making customers more satisfied. Finally, privacy is the guarantee that data regarding shopping behaviour and credit card information are secure.

In e-SERVQUAL, the recovery scale comprises responsiveness, contact, and compensation. Responsiveness focuses on the ability of e-retailers and e-service providers to offer suitable information to clients when faced with a problem, having methods for processing returns, and offering online guarantees (Nemati et al., 2012). Compensation entails getting money back, while contact involves the mechanisms established to ensure customers speak to customer agents on the phone or online (Nemati et al., 2012). All the dimensions of e-SERVQUAL are essential in the banking sector because customers evaluate service quality when selecting a bank (Javed et al., 2018).

In addition, other dimensions of service quality have been proposed to evaluate e-service quality, but there is an overlap between these dimensions and those of e-SERVQUAL. Some of the most significant e-service quality dimensions are; ease of use, information/content, responsiveness, privacy, and fulfilment (Yarimoglu, 2015). Importantly, ease of use focuses on the accessibility and functionality of a site and is the most vital aspect that impacts willingness to purchase over the internet. Information or content is concerned with the availability of reliable and recent information on the website, while responsiveness is concerned with solving customers' problems quickly and in a timely manner (Yarimoglu, 2015). Fulfilment is concerned with the accuracy of online transactions, while privacy entails securing customer data (Yarimoglu, 2015).

E-banking is increasingly being used in the contemporary banking sector. Okoro (2014) defines e-banking as the utilization of telecommunication devices to complete banking transactions. The banking sector considers the new digital technology as having the potential to improve customers' satisfaction levels and help to create loyalty among customers (Okoro, 2014). A recent study found that almost all banks have adopted some level or attributes of e-banking to improve service quality and attract new clients (Adeyemi, Ola & Oyewole, 2014).

Moon (2013) suggests that e-service quality can be evaluated based on both intangible and tangible attributes. Tangible elements of e-service quality comprise human-made elements and might encompass three facets, which are ambient factors, social factors, and design factors. Social factors are important when determining whether to adopt new technology (Ivanov & Webster, 2017). In an offline environment, design factors include layout design and architectural aesthetics (Moon, 2013). An e-SERVQUAL model developed in a previous study focusing on the quality of services on the internet highlighted web design as an essential tangible factor (Huang, Li & Zeng, 2007). Website

design can be described in the light of two facets, aesthetics and ease of use. The aesthetics of web design comprise things like text, colour, and graphics that are appealing to the customer (Moon, 2013). Ease of use can be defined as the ease with which a website visitor can navigate the site without being subjected to unnecessary steps. For example, a retailer known as Black Diamond uses AI to increase the ease of use of its website (Thiel, 2018). Good websites have excellent organization and allow customers to search easily (Moon, 2013). The aesthetics of a web site involves providing uncluttered screens to clients, providing logical flow, and simple search paths.

E-payment is the most common form of electronic banking in the contemporary banking industry (Ariff et al., 2013). Even though electronic banking has become common in banking, long waiting hours, ineffective online services, and online fraudulent activities remain a significant challenge to the banking industry (Ariff et al., 2013). The e-SERVQUAL model is useful for this research because it seeks to determine the perceptions of customers regarding the quality of services offered by banks through websites and virtual assistance.

2.6 Conclusion

Even though there is no universal definition of AI, researchers and scientists tend to agree that AI comprises machines with human-like reactions and the ability to make judgments (West, 2018). AI-powered technologies such as virtual chatbots are increasingly being adopted in the service industry to replace human customer service (Fluss, 2017). Virtual chatbots are perceived as important in the service sector because they enhance self-service. Banks are adopting chatbots to offer services efficiently and improve customer experience (Anurag, 2019). For instance, chatbots can allow customers to access the services of their bank 24/7 regardless of their location (Anurag, 2019). The increased use of AI in the banking sector is critical in enhancing customer experience.

Based on this literature review, AI-powered digital assistants appear to have the potential to have a positive effect on customer satisfaction because they are designed to meet customer expectations (Brill et al., 2019). Both SERVQUAL and e-SERVQUAL models are useful in evaluating quality of services. The SERVQUAL model is helpful in assessing service quality in general (Parasuraman et al., 1998), while the e-SERVQUAL model specifically helps establish customer perceptions regarding the quality of e-services (Nemati et al., 2012), while Both SERVQUAL and e-SERVQUAL models could be effective in assessing the impact and benefit of using AI avatars in the banking sector.

This review has identified significant gaps in research regarding how AI influences customer's perception of bank service quality and customer satisfaction. There is little research on how individual customers view the quality of bank services provided through chatbots. Recent research focuses on how banks use AI to analyse customer data and manipulate big data (Buechler, 2019), determine risky borrowers or who should be offered a loan (West & Allen, 2018). Most studies tend to investigate the benefits of AI to banks rather than the benefits to customers. Hence, this gap in the research will be addressed because customer satisfaction and loyalty are important to the survival of individual banks. The next chapter of this thesis presents the methodology to address the gaps in the current literature.

Chapter 3: Method

3.1 Introduction

Chapter 2 has shown how the use of AI has evolved including its use in the banking industry. More importantly it highlighted the gaps in research concerning the effects of the utilization of AI in banks especially as it has an impact on clients' perceptions of the quality of services. This chapter will present the research method used in this study, including the research design, the experimental procedure used, the research questionnaire and the data analysis methods employed to generate the results.

3.2 Research Design

A research design is a systematic framework that guides an investigator in the processes of gathering, analyzing, and interpreting information or knowledge about a phenomenon (Walliman, 2011). The experimental method was used in this research which isolates and controls relevant conditions that influence the events being examined and then observes the impact when the conditions are controlled (Walliman, 2011). The nature of experimental research entails making changes to independent variables and then observing the effects on dependent variables. According to Walliman (2011), experiments often require the development of a hypothesis which helps determine the variables that will be tested and how to control and measure them.

A quantitative study was also performed for this research. Quantitative research is utilized to quantify or measure a specific phenomenon or problem in the form of numerical or some other type of data that can be presented statistically (Walliman, 2011). This type of research deals with numbers and utilizes mathematical operations to investigate the properties of the numerical data. The types of data used in quantitative research are different from qualitative research that uses data in the form of words (Walliman, 2011).

The quantitative method was chosen for this research because it is best suited to answer the research question. This research method was appropriate because it allows the subjects to be observed under varying conditions during the research. There was also a need to manipulate variables and control others in order to establish cause and effect. Essentially, the selected research design allowed for the testing of the influence of AI avatars on perceived service quality and customer satisfaction in an interaction between customers and a bank.

3.3 Subjects

A quota sample was used for participant selection and recruitment. Quota sampling involves recruiting a tailored sample from a selected population (Bornstein, Jager, & Putnick, 2013). The entire population is categorized into strata and samples are drawn from the strata to meet a quota. Strata are selected based on their relevance to the topic being studied. For this research, bank users who normally use internet banking services were grouped into strata, in this case male versus female.

In order to recruit the subjects, the researcher went to the AUT University Library to recruit volunteers. Students at the library were told about the study, given a participant information sheet and invited to take part in the study. At that point subjects sat in the library and completed the experiment on a laptop.

For this study 60 participants were recruited aged between 20 and 54. They were divided into two matching groups. Group One consisted of 30 men, 15 interacting with the virtual banking assistant and 15 simply using the internet. Group Two comprised 30 women, 15 interacting with the virtual banking assistant and 15 simply using the internet.

3.4 Experimental Procedure

The hypothesis comprises both an independent and a dependent variable. The independent variable is the cause, while the dependent variable is the variable affected (Walliman, 2011). For this study, the independent variable is the use (or not) of the virtual assistant, while the dependent variables are (a) service quality and (b) customer satisfaction. The proposed moderator in these relationships is gender.

A necessary aspect of the research was to define how the dependent variables would be measured. Ideally, the measurement of the variables would involve determining the quality of bank services and the level of customer satisfaction.

Subjects sat at an internet-enabled laptop and used the laptop to undertake four information-based tasks associated with banking (Table 3.1). The experimental group was directed to the site for the ANZ Bank virtual assistant [Jamie](#). However, the control group performed the same tasks using the internet, for example Google search, but not the virtual assistant Jamie. Both the experimental group and the control group then completed an anonymous online questionnaire through Qualtrics (Appendix B).



Figure 3.1 ANZ's virtual assistant Jamie

Table 3-1: Information-based Tasks Undertaken by Each Participant

Task Number	Task
1	How much is the mortgage interest rate for a one-year fixed home loan with ANZ Bank?
2	What size of deposit do I need for a home loan with ANZ Bank?
3	How long will it take to approve an ANZ Bank home loan?
4	How much do I need to deposit for a second home loan with ANZ Bank?

3.5 Questionnaire

Table 3-2: Structure of the questionnaire

Section	Content
Information sheet	This section consists of the project title, an invitation, research purpose, research procedure, benefits for participants, privacy protection, and contact information.
Gender and age	This section requests participants to specify their gender and age category.
Measure of service quality	This section has 30 items and asks participants to indicate their perception of the bank's service quality.
Measure of customer satisfaction	This section consists of eight items and requests participants to indicate their level of satisfaction with the bank's services.

The questionnaire for this study was developed through a combination of scales for the measurement of customer satisfaction and service quality, SERVQUAL AND e-SERVQUAL. The reasoning behind having a combination of scales rather than using either one or both in tandem was due to the nature of the trial. Certain SERVQUAL measures, measuring service quality from human representatives are not measurable for an experience with a virtual assistant, for example, “they should not be expected to have operating hours convenient to all their customers” (from the empathy dimension). The e-SERVQUAL measures are specific to online service quality but some, such as fulfillment, were not being tested here. The participants were not undertaking transactions, only getting information from the bank's site. The final questionnaire comprised four sections, an information sheet, questions on gender and age, service quality and customer satisfaction measures (Table 3.2). First, the SERVQUAL scale was adapted for the service quality measurement. As a first step, three items of the SERVQUAL scale were deleted,

including “their employees should be well dressed and appear neat” (from the tangibility dimension), “their employees should get adequate support from these firms to do their jobs well” (from the assurance dimension), and “they should not be expected to have operating hours convenient to all their customers” (from the empathy dimension). These three items were deleted as they were not relevant to the context of this study. The SERVQUAL instrument was adapted from an article by Parasuraman, Zeithaml, and Berry (1988). The remaining 19 items were each measured using a seven-point scale ranging from strongly disagree (1) to strongly agree (7) (Parasuraman et al., 1998). SERVQUAL scales were used for this research because the tool has good validity and reliability and can be used for different services (Jiang, Klein & Crampton, 2000). The items of SERVQUAL that were used in this research are shown in Table 3.3.

Table 3-3: SERVQUAL items used in the questionnaire

Item Number	Item
1	This bank has up-to-date equipment
2	This bank’s physical facilities are visually appealing
3	This bank’s appearance is in keeping with the type of the service provided
4	When this bank promises to do something by a certain time, it does so
5	When you have a problem, this bank is sympathetic and reassuring
6	This bank is dependable
7	This bank provides its services at the time it promises to do so
8	This bank keeps its records accurately

Item Number	Item
9	This bank does not tell customers exactly when the service will be performed
10	You do not receive prompt service from this bank
11	This bank is not always willing to help customers
12	This bank is too busy to respond to customer requests promptly
13	You can trust this bank
14	You feel safe in your transactions with this bank
15	This bank is polite
16	This bank does not give you individual attention
17	This bank does not give you personal attention
18	This bank does not know what your needs are
19	This bank does not have your best interest at heart

Next, the e-SERVQUAL was adapted from an article by Parasuraman, Zeithaml, and Malhotra (2005). However, not all the dimensions of e-SERVQUAL, i.e. efficiency, system availability, fulfilment and privacy, were used. Only the efficiency and privacy dimensions were used in this thesis as they were pertinent as, according to Javed et al. (2018), customers consider efficiency, reliability and privacy when checking the quality of e-services, including online banking. Therefore, efficiency and privacy were important for identifying participants' perceptions of bank service quality. E-SERVQUAL is an instrument for measuring the quality of services offered by web sites while customers are

shopping online. It is a seven-point scale, ranging from strongly agree (7), to strongly disagree (1) (Parasuraman et al., 2005). The dimensions of e-SERVQUAL are relevant to this study because the tool can be used to measure service quality for a variety of internet-based services. The specific items that were adopted from this instrument are listed in Table 3.4. Overall, the questionnaire measured the quality of services delivered by the bank, mainly focusing on how participants interacted with the bank platform, the ease of receiving the service and the kind of help received.

Table 3-4: E-SERVQUAL items in the Questionnaire

Item Number	Item
20	This site makes it easy to find what I need
21	It makes it easy to get anywhere on the site
22	It enables me to complete a transaction quickly
23	Information on this site is well organized
24	This site loads its pages fast
25	This site is simple to use
26	This site enables me to get on to it quickly
27	It protects information about my web-behavior
28	It does not share my personal information with other sites
29	This site protects my personal information

The final step in preparing the questionnaire entailed adopting a measure of customer satisfaction from the work of Westbrook and Oliver (1981). The scale from

Westbrook and Oliver (1981), which uses a 7-point semantic differential, is shown in Table 3.5.

Table 3-5: Satisfaction Scale

Item	Extreme Satisfaction	Extreme Dissatisfaction
1	Pleased me	Displeased me
2	Contented with service	Disgusted with the service
3	Very satisfied with service	Very dissatisfied with service
4	Did a good job for me	Did a poor job for me
5	Happy with service	Unhappy with the service
6	Good value	Bad value
7	Enjoyable	Frustrating
8	Very favorable	Very unfavorable

The questionnaire measured customer satisfaction with the services provided by the bank. Subjects were asked to indicate whether they were pleased, content, satisfied, or happy with the services. For instance, participants could indicate on the scale whether they were contented with the service or disgusted with the service. They could also indicate whether the service was enjoyable or frustrating. Therefore, the research instrument first assessed the general satisfaction with the bank's services.

The final questionnaire for this research consisted of 29 items intended to measure the quality of services offered by banks (see Appendix B). In addition, the questionnaire had eight items intended to measure the level of customer satisfaction. For each item, a 7-point scale ranging from strongly agree to strongly disagree, was used (see Appendix B).

3.6 Analysis

Data was extracted from the completed questionnaires. The data for the two groups (Use of virtual Assistant versus not) was compared using *t*-tests and ANOVA. ANOVA is an appropriate analysis tool that can be used to assess whether the experimental group and the control group differ substantially on a measure of the dependent variable (Kardes, Herr & Schwarz, 2019). The collected data was sorted and entered into SPSS software to enable quantitative testing. The hypotheses were tested using *t*-tests and ANOVA. If the hypotheses were supported, the group that accessed the services using the virtual assistant Jamie should record a higher perception of quality for the services offered by the bank, and correspondingly a higher level of satisfaction.

3.7 Ethical Considerations

This research received ethical approval from the AUT Ethics Committee, AUTEK. The anonymity of the participants was preserved, as their personal details were not requested. Only the participants' age and gender were requested, as these were used for comparisons between the two groups. The participants' consent was received through the participant information sheet which informed the participants that "filling out the questionnaire will be taken as consent to participate in the research". Thus, by completing the survey, participants gave their consent. See Appendix B for the participant information sheet.

Chapter 4: Results

4.1 Introduction

This chapter presents the results of the research. First, exploratory factor analysis was applied (principle components analysis with varimax rotation) on the 29 service quality items to identify the dimensions of service quality. Then the reliability of the eight satisfaction items was tested. T-tests were then conducted to detect whether use of a digital assistant influenced service quality and satisfaction. Finally, two-way ANOVA was conducted to test whether gender as a moderator would influence the use of digital assistance on customer perceptions of service quality and customer satisfaction.

4.2 Profile of the Sample

The total sample size was 60, comprised of 30 female and 30 male subjects. Fifty percent of each gender group used the digital assistant while the other 50% did not, as shown in the table below.

Table 4-1: Composition of Sample

	Female	Male	Total
Digital assistant	15	15	30
No digital assistant	15	15	30
Total	30	30	60

As can be seen in Figure 4.1, most of the subjects are between 18-34 years accounting for just over 90 percent of all subjects, while those 35 years and over made up just 10 percent.

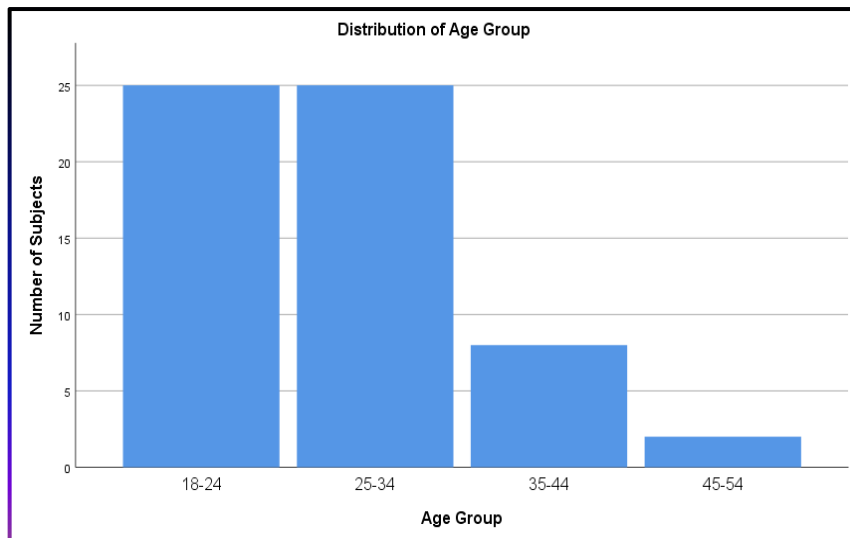


Figure 4.1 Age of subjects

4.3 Dimensions of Service Quality

Exploratory factor analysis (principle components analysis with varimax rotation) was applied on the 29 items of service quality to identify the dimensions and measure of service quality.

SPSS extracted all factors with eigenvalues greater than 1, which identified five factors. Factor one measured *appearance*, including whether the physical facility was visually appealing, the second factor measured *reliability* comprising; keeping a promise, reassurance, keeping to time, accurate records, trust, safety). The third factor measured *responsiveness* including; does not tell customers exactly when the service will be performed, does not receive prompt service, not always willing to help, too busy to respond promptly, no individual attention, no personal attention, does not know your needs, does not have your interests at heart. The fourth factor was the e-SERVQUAL dimension of *efficacy* including; easy to find what I need, easy to get anywhere on the site, information is well organised, loads pages fast, simple to use, get onto it quickly. The last factor was the e-SERVQUAL dimension of *privacy* including; protects my information, does not share my personal information, as shown in Table 4.2. Rotation had the effect of

optimizing the factor structure, and one consequence for these data was that the relative importance of the five factors was somewhat equalized (Basto & Pereira, 2012).

Appendix D shows complete data on the rotated component matrix, which is a matrix of the factor loading for each variable on each factor.

Table 4-2: Principal components analysis – service quality

Factors	Items	Score
Appearance	This bank's physical facilities are visually appealing.	.719
	This bank's appearance is in keeping with the type of the service provided.	.825
Reliability	When this bank promises to do something by a certain time, it does so.	.700
	When you have a problem, this bank is sympathetic and reassuring.	.584
	This bank is dependable.	.746
	This bank provides its services at the time it promises to do so.	.795
	This bank keeps its records accurately.	.667
	You can trust this bank.	.686
	You feel safe in your transactions with this bank.	.629
Responsiveness	This bank does not tell customers exactly when the service will be performed.	.683
	You do not receive prompt service from this bank.	.783
	This bank is not always willing to help customers.	.764

Factors	Items	Score
	This bank is too busy to respond to customer requests promptly.	.804
	This bank does not give you individual attention.	.762
	This bank does not give you personal attention.	.864
	This bank does not know what your needs are.	.765
	This bank does not have your best interest at heart.	.780
Efficiency	This site makes it easy to find what I need	.707
	It makes it easy to get anywhere on the site	.701
	Information on this site is well organized	.862
	This site loads its pages fast	.830
	This site is simple to use	.876
	This site enables me to get on to it quickly	.782
Privacy	It protects information about my web-behavior	.703
	It does not share my personal information with other sites	.900
	This site protects my personal information	.838

4.4 Reliability of the Service Quality Measure

A reliability test was conducted on the twenty-nine items measuring service quality. As we can see in Table 4.3, the reliability (Cronbach's $\alpha = .968$) is very high.

Table 4-3: Reliability statistic – service quality

Cronbach's Alpha	No of Items
.829	29

4.5 Dimensions of Customer Satisfaction

Exploratory factor analysis (principle components analysis with varimax rotation) was conducted on the eight items for customer satisfaction to identify the items and measure customer satisfaction. SPSS extracted all factors with eigenvalues greater than 1, which identified all items loading on one factor as shown in Table 4.4.

Table 4-4: Principle components analysis – Customer satisfaction

Factor	Items	Component
Satisfaction	Displeased me vs. Pleased me	.869
	Disgusted with the service vs. Contented with service	.911
	Very dissatisfied with service vs Very satisfied with service	.948
	Did a poor job for me vs. Did a good job for me	.879
	Unhappy with the service vs. Happy with service	.888
	Bad value vs. Good value	.947
	Frustrating vs. Enjoyable	.886
	Very unfavourable vs. Very favourable	.933

4.6 Reliability of the Customer Satisfaction Measure

A reliability test was conducted on the eight items measuring satisfaction. As we can see in Table 4.4, the reliability (Cronbach's $\alpha = .968$) is very high.

Table 4-5: Reliability statistic – Customer satisfaction

Cronbach's Alpha	No of Items
.968	8

4.7 Test of Hypothesis 1 Regarding Service Quality

H1 predicted that using a digital assistant would enhance perceptions of service quality. For each aspect of service quality (Appearance, Reliability, Responsiveness, Efficiency and Privacy), an independent t -test sample was conducted to examine whether the two groups (virtual assistant or not) were significantly different. The results showed that for each measurement in terms of service quality, there was no significant difference between having a virtual assistant and not having a virtual assistant (for appearance; $t(58)=1.92, p=.238.$, for reliability; $t(58)=.152, p=.880.$, for responsiveness; $t(58)=1.13, p=.316.$, for efficiency; $t(58)=.693, p=.491.$, for privacy; $t(58)=.539, p=.592.$). Note that the mean difference in the table is based on 'no digital assistant' minus 'digital assistant'. For more details on the analysis see Appendix E.

Table 4-6: Independent sample t-test – Service quality

Service quality	<i>t</i>-value	<i>df</i>	<i>P</i>-value	Mean difference ('Digital Assistant' -- 'No digital assistant')
Appearance	1.92	58	.239	.23333
Reliability	.152	58	.880	.03333
Responsiveness	1.13	58	.316	.32083
Efficiency	.693	58	.491	.17222
Privacy	.539	58	.592	.15556

4.8 Test of Hypothesis 2 Regarding Customer Satisfaction

Hypothesis 2 predicted that using a digital assistant would influence perceptions of customer satisfaction. Thus, in order to determine if using a digital assistant might affect customer satisfaction a *t*-test was conducted. The results showed that the mean score for using a virtual assistant was 5.7125 and that for no virtual assistant was 5.6292, there being no significant difference between these two groups in customer perception regarding customer satisfaction ($t(58) = -.294$, $p = .770$). For more details on the analysis see Appendix F.

Table 4-7: Independent sample t-test – Customer satisfaction

	<i>t</i>-value	<i>df</i>	<i>P</i>-value	Mean difference (Digital assistant -- No digital assistant')
Satisfaction	-.294	58	.770	.08333

4.9 Test of Gender as a Moderator

In this section, we further explored whether gender could moderate the effect of using a digital assistant on perceptions of service quality and customer satisfaction.

A two-way ANOVA was conducted with virtual assistant and gender as main effects and virtual assistant* gender as an interaction effect. From the results, we can see that for each measurement of service quality (Appearance , Reliability, Responsiveness, Efficiency and Privacy), none of the relationships were significant (for appearance; virtual assistant, $F(1)= 1.389$, $p=.249$, gender, $F(1)=.028$, $p=.867$, virtual assistant * gender, $F(1)=.709$, $p=.404$, for Reliability; virtual assistant, $F(1)=.022$, $p=.881$, gender, $F(1)=.500$, $p=.482$, virtual assistant * gender, $F(1)=.022$, $p=.881$, for responsiveness; virtual assistant, $F(1)=.990$, $p=.324$, gender, $F(1)=.038$, $p=.847$, virtual assistant * gender, $F(1) =.000$, $p=.990$, for efficacy; virtual assistant, $F(1)=.465$, $p=.498$, gender, $F(1)=.000$, $p=.983$, virtual assistant * gender, $F(1)=.109$, $p=.743$, for privacy; virtual assistant, $F(1)=.289$, $p=.593$, gender, $F(1)=.715$, $p=.402$, virtual assistant * gender, $F(1)=.998$, $p=.322$). See Table 4.7. This means gender had no influence on the effect of a digital assistant on customer perceptions regarding service quality. For more details on the analysis see Appendix G.

Table 4-8. Two way-ANOVA – Gender as a moderator of service quality

Appearance	F	df	p-value
Virtual assistant	1.389	.1	.244
Gender	.028	.1	.867
Virtual assistant*gender	.709	.1	.404

Reliability			
Virtual assistant	.022	.1	.881
Gender	.500	.1	.482
Virtual assistant*gender	.022	.1	.881
Responsiveness			
Virtual assistant	.990	1	.324
Gender	.038	1	.847
Virtual assistant*gender	.000	.1	.990
Efficiency	F	df	<i>p</i>-value
Virtual assistant	.465	1	.498
Gender	.000	1	.983
Virtual assistant*gender	.109	.1	.743
Privacy	F	df	p-value
Virtual assistant	.289	1	.593
Gender	.715	1	.402

Virtual assistant*gender	.998	.1	.322
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The influence of gender on the effect of a digital assistant on customer satisfaction was also explored. The result showed that the interaction between gender and the digital virtual assistant was not significant, $F(1)=.084, p=.773$, gender, $F(1)=.041, p=.840$, virtual assistant * gender, $F(1)=.164, p=.687$ (see Table 4.8). This means gender had no influence on the relationship between the use of a digital assistant and customer perceptions of satisfaction. For more details on the analysis see Appendix H.

Table 4-9: Two way-ANOVA – Gender as a moderator of satisfaction

Satisfaction	F	df	p-value
Virtual assistant	.084	1	.773
Gender	.041	1	.840
Virtual assistant*gender	.164	.1	.687

4.10 Qualitative Insights from Comments Made by Research Subjects

Further insights were gained from the qualitative comments made by the using subjects when using the virtual assistant. Regarding the group using the virtual assistant “Jamie”, participants described their experience with Jamie, including their emotions associated with interacting with Jamie. One female participant mentioned that "even if I got the exact answer from Jamie, I still prefer to go to the bank and talk to a real person". A male participant who is also a non-native English speaker expressed his frustration and said, “I found difficulties to interact with Jamie because of my accent. Jamie did not understand my accent and my requirements. She kept on replying “I do not understand”

and repeated the welcome sentences”. Yet another male participant was disappointed with the interaction and mentioned that Jamie was slow, and it was hard to communicate with Jamie. This participant also added that talking to Jamie was an inconvenience. Another participant also mentioned that Jamie was slow. Additionally, one female participant mentioned that “it sounds a little bit weird to me as this is my first time interacting with a robot”. On the other hand, another female participant expressed her delight and said, “Talking to Jamie is amazing and Jamie is so helpful”. This participant also mentioned that if this avatar was developed to be more precise and accurate, then it would be a great achievement.

It might be the case that customers will need more time and experience in interacting with virtual assistants. Many subjects said, “We're a customer of this bank but we did not know about Jamie”. Customers were surprised to learn about this service and were not aware that their bank provided such a service. Customers may need to be informed about and trained to interact with Jamie. Jamie is an intelligent virtual assistant and therefore interacting with her is very unlike interacting with a real human, people have to be direct and straightforward when interacting with virtual assistants. When the subjects were asked to interact with Jamie in the experiment, the subjects usually started their interaction with “Hi” or “I'd like to know" or "I have a question, how much do I need ..., etc.” In most of these cases, Jamie was not able to comprehend what the customers were saying and kept repeating the phrase “How I can help”. When this happened, the customer got confused and could not understand why Jamie was repeating the same thing over and over again. The researcher had to intervene and explain that Jamie was an avatar, not a human, so the participant should not speak until the welcome phrase ended. The participants were then asked to talk to Jamie directly, without using "Hi" or "I have a

question." In some cases, the participants were asked to speak more loudly so that Jamie could comprehend what was being said.

On the other hand, within the website group, most of the participants commented that they could not find all the answers to the tasks. Additionally, some mentioned that the website did not have accurate information and they were not able to find the answer. They concluded that, instead of using the website, customers preferred to go to the bank in person for such information.

Chapter 5: Discussion

5.1 Introduction

This thesis sought to confirm whether the use of an AI avatar positively influences customers' perceptions regarding the quality of bank services and increases levels of customer satisfaction. Banks adopt AI primarily to improve service quality and reduce operating costs (Li & Du, 2017). In line with the increased adoption of AI in banking, this thesis sought to address the gap in the literature regarding how customers perceive the quality of the services offered by digital assistants. This chapter will answer the research question and hypotheses, address the research objectives, consider theoretical contributions, managerial implications, limitations, and areas for future research.

5.2 Explaining the Findings

5.2.1 Answer to the research question and hypotheses

Two hypotheses were proposed in this thesis:

H1: Use of an AI virtual assistant will enhance bank customers' perceptions of service quality.

H2: Use of an AI virtual assistant will enhance bank customers' levels of satisfaction.

The hypotheses were tested using independent sample *t*-tests and two-way ANOVA to test gender as a moderator in the theoretical relationships. Contrary to the hypothesized association in H1, the results indicate that there is no significant difference between using a virtual assistant and the group who used the bank's website regarding the perceptions of service quality. Similarly, the results do not support H2, as there was no significant difference between the group using the virtual assistant and the one that accessed the bank through its website regarding perceptions of customer satisfaction. Based on the results, customers who

use a virtual assistant and those who do not use a virtual assistant will have the same level of satisfaction and will likely give similar ratings for bank service quality.

Two-way ANOVA analysis showed that gender as a moderator did not influence the perceptions of bank service quality for the participants who used the digital assistant. Both males and females reported equal levels of service quality when accessing bank services using the digital assistant or the website.

The research question for the study was, “How does an artificial intelligence interface influence customer perception regarding the quality of services a bank offers?” The data suggests that AI does not have a meaningful influence on customer perceptions of the quality of bank services for the student sample who interacted with ANZ’s Jamie. In this regard, customers do not feel that the introduction of AI enhances the measure of service quality in banks when compared to using a website.

5.2.2 Answer to the research objective

The objective of this research was to investigate the association between an AI avatar interface and customer perceptions of bank service quality. Importantly, this general objective was assessed from three approaches. First, this thesis investigated the effect of AI avatars on perceptions of bank service quality. Second, the thesis assessed whether an AI virtual assistant could improve the provision of and access to bank services.

Based on the results, currently customers do not feel that the use of an AI avatar to access bank services enhances the quality of services. The test population that used the digital assistant recorded the same level quality as those who did not use the digital assistant.

The general purpose of this study is to examine the relationship between AI avatars and customer perceptions of and satisfaction with the quality of bank services. Regarding the

aspect of service quality, the results indicated that customer interactions with Jamie did not improve bank service quality. Individuals in the study population reported various experiences with Jamie, which indicated that the digital assistant did not enhance service quality. One participant indicated that Jamie was hard to communicate with and slow. The production and consumption of services are inseparable, meaning that service quality depends on the process of delivering the services and the service itself (Sharabi & Davidow, 2010). Hence, when the delivery of a service is slow, customers will have a perception that the services are of low quality. If the process of delivering a service is flawed, the quality of service would be perceived as low, even if the service is favourable (Sharabi & Davidow, 2010). Akkucuk and Teuman (2016) further indicate that slowness is one of the factors that cause bank customers to rate bank services as low quality. Some participants thought that the digital assistant does not improve service quality because using an avatar is 'weird'. More specifically, individuals using an AI avatar for the first time may feel uncomfortable and have difficulties in knowing how to generate the required information from the digital assistant.

Participants in this thesis study felt that Jamie could not produce the needed answers, which affected the perception of service quality. An assessment of participant's comments during the study found that Jamie is unable to answer many questions and responds only when questions are framed in a certain way. It is evident that this virtual assistant could not understand some questions. Instead of giving the required response, Jamie kept repeating the same phrase, "How can I help?" Participants felt frustrated by the digital assistant's inability to understand their question, leading to a low perception of service quality. When a person asks a digital assistant a question, he or she wants a helpful answer (Murnane, 2018). Answering questions is among the primary functions of digital assistants, and users or customers often use the digital assistants to seek answers. When a digital assistant fails to

produce a correct answer, users are likely to get frustrated about the quality of the service (Murnane, 2018).

Another essential element of this thesis was to investigate whether an AI avatar enhances the provision and accessing of bank services. The results show that there is no association between using an AI virtual assistant and increased ease of accessing services. In fact, there is a negative correlation between the use of AI and the simplicity of accessing services. However, the ease of accessing bank services through a digital assistant can also be assessed based on how confident customers are in the answers they get. People often prefer to speak directly to human customer services staff for various reasons, such as the ability to obtain information quickly (Johnson, 2017). Customers also want to talk to a real person because they want a quick answer or seek to make a high-value purchase (Johnson, 2017). Furthermore, the findings show that the digital assistant might not improve service quality in banking for people who have a heavy accent. For example, one participant in the study indicated that Jamie could not understand his questions because of his accent. In instances when the digital assistant is unable to interpret a question, it repeats the same message again and again, leading to customer frustration. Therefore, the results show that there is no positive correlation between use of an AI avatar and perceptions of bank service quality.

5.3 Theoretical Contribution

The findings of this thesis have theoretical implications. In accordance with the TAM model, customers are likely to use new technologies that are perceived as useful and easy to use (Wirtz et al., 2018). Some users might only accept AI if it acts a support tool, and offers personalized services (Longoni et al., 2019). On the other hand, users might resist the use of AI systems if the systems are used to replace rather than support professional decisions (Longoni et al., 2019). In relation to TAM, customers are ready for AI if it offers information

and options that are curated and narrowed in a personalized manner (Kumar et al., 2019). For this thesis, the TAM model is relevant as most of the participants did not express a willingness to use Jamie again when seeking bank services. Most participants did not view Jamie as a helpful AI system that is easy to use. The findings contradict the arguments of Rehman et al. (2016) that the application of AI in banks has a major effect on the perceptions of customers concerning bank service quality. In addition, the results of this thesis refute the assertions of Maskey (2018) that AI has the potential to enhance service quality and customer satisfaction. Maskey (2018), forecasts that the banking sector will save approximately \$1 trillion by 2030 through enhanced service quality and client gratification. Moreover, Kuo et al. (2017) claim that avatars, AI, and service automation offer services in attractive and interactive ways, improving the perceptions of service quality. The results of this thesis do not support the claims of Kuo et al. (2017). This study found that in this case, the virtual assistant did not offer a more attractive, interactive way to gain information from the bank.

Role theory suggests that customers' acceptance of AI avatar services is based on the AI's ability to meet functional needs and act in socially-accepted ways (Wirtz et al., 2018). In this case, users might expect AI to behave like human and exhibit some traits of human. The personality traits that define human are "openness, conscientiousness, extraversion, agreeableness, and neuroticism" (Kietzmann, Paschen & Treen, 2018). Price Waterhouse Coopers (2017) observes that the utilization of AI systems assists people to handle tasks better and more rapidly. Similarly, Fluss (2017) claims that intelligent chatbots have substantial processing power because they function on fast virtual servers. On the contrary, the results of this thesis indicate that these types of virtual assistants are slow. One participant in this study indicated that Jamie was slow, leading to an experience of frustration. Therefore, this thesis refutes the claims that an AI avatar is faster in comparison with human assistance.

Regarding customer satisfaction, the data analysed in this thesis contradicts the arguments that AI increases satisfaction levels. One of the dominant arguments is that the banking sector is adopting AI to increase customer satisfaction and improve service efficiency (Leong et al., 2015). Contrary to this these results show that Jamie has not improved service efficiency because of the failure to understand customer questions and the slowness of its response. The literature further indicates that AI has the potential to reduce waiting time in banks, increase loyalty and satisfaction levels (Omale, 2019). However, this thesis shows that Jamie did not reduce the waiting time while accessing bank services. In fact, participants indicated that they still wanted to talk to a real person after being served by Jamie, which could increase the time taken to seek services substantially.

While the literature suggests that digital assistants are programmed to satisfy customer expectations (Brill et al., 2019), the findings of this study suggest that the digital assistant did not meet consumer expectations. Most importantly, participants expected human-like interactions with Jamie when asking questions, but Jamie did not offer this type of interaction or any useful responses. In general, the findings for this sample of students using ANZ Bank's Jamie entirely contradict existing literature regarding the use of an AI avatar and perceptions of banking service quality.

5.4 Managerial Implications

The results provide new insights into the association between AI virtual assistants, service quality, and customer satisfaction. Bank managers and marketing personnel can use the findings to ensure the adoption of AI increases customer perceptions of a bank's service quality and satisfaction. Banks may have to inform their customers what to expect when using AI virtual assistants and also offer guidance on the best way to ask them questions. Customers want fast resolution, personalized experience, and short waiting times (Lachman,

2019). In this study, participants expected human-like interactions and helpful responses when they asked Jamie questions. From comments from participants it emerged that they did not know how to frame or ask their questions so that Jamie would understand them. For example, customers used phrases that Jamie did not understand, such as ‘Hi,’ or ‘I have a question.’

This leads to the idea that banks must ensure the efficiency and accuracy of AI based virtual assistants if they are to deliver on their promise of increasing service quality and customer satisfaction. According to Shabbir and Anwer (2018), AI systems have the capacity to learn so this should be used by banks to ensure that their digital assistants’ algorithms continues learning through interaction with customers, which will increase their efficiency and accuracy.

5.5 Limitations and Future Research

The generalizability of the findings is limited by the small sample size. Each cell in this study would require at least 50 participants to prove more generalizable. In addition, the sample was only comprised of students from New Zealand who might have different thoughts and expectations from those of non-students when using AI. The findings might not represent the perceptions and experiences of the entire population regarding the use of AI virtual assistants to access bank services. Nevertheless, an appropriate methodology and careful data analysis were used that supports the validity of the results.

Further research is required to establish whether customers who are informed about what to expect from an AI avatar and have been trained in how to use digital assistants have increased perceptions of bank service quality and better satisfaction scores.

5.6 Conclusion

This research aimed to explore the relationship between AI avatars and customer perceptions of bank service quality. Specifically, the study investigated the effect of using a virtual assistant on customers' perceptions of bank service quality and satisfaction levels. The rationale of the thesis is that banks serve many clients and are under competitive pressure to improve their services. Thus, there is a need to evaluate the real impact of AI on customers' perceptions. The results contradict the proposed hypotheses that virtual assistants increase customers' perceptions of bank service quality and satisfaction. In this case, the use of a virtual assistant, Jamie, did not affect participants' perception of service quality and satisfaction positively. Consequently, banks need to inform customers how to use virtual assistants and increase what virtual assistants can understand in terms of verbal and non-verbal cues. More research is needed to determine whether bank customers who are trained in how to use digital assistants and informed about what to expect from an AI system report increased perceptions of service quality and higher satisfaction scores.

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APPENDICES

Appendix (A)

Ethical approval



Auckland University of Technology Ethics Committee (AUTEC)

Auckland University of Technology
D-88, Private Bag 92006, Auckland 1142, NZ
T: +64 9 921 9999 ext. 8316
E: ethics@aut.ac.nz
www.aut.ac.nz/researchethics

28 November 2019

Ken Hyde
Faculty of Business Economics and Law

Dear Ken

Re Ethics Application: **19/455 The influence of Artificial Intelligence (AI) on the quality of customer service in banking: How does robotic AI influence customer's perception regarding the quality of services the bank offers**

Thank you for providing evidence as requested, which satisfies the points raised by the Auckland University of Technology Ethics Committee (AUTEC).

Your ethics application has been approved for three years until 27 November 2022.

Standard Conditions of Approval


1. The research is to be undertaken in accordance with the [Auckland University of Technology Code of Conduct for Research](#) and as approved by AUTEC in this application.
2. A progress report is due annually on the anniversary of the approval date, using the EA2 form.
3. A final report is due at the expiration of the approval period, or, upon completion of project, using the EA3 form.
4. Any amendments to the project must be approved by AUTEC prior to being implemented. Amendments can be requested using the EA2 form.
5. Any serious or unexpected adverse events must be reported to AUTEC Secretariat as a matter of priority.
6. Any unforeseen events that might affect continued ethical acceptability of the project should also be reported to the AUTEC Secretariat as a matter of priority.
7. It is your responsibility to ensure that the spelling and grammar of documents being provided to participants or external organisations is of a high standard.

AUTEC grants ethical approval only. You are responsible for obtaining management approval for access for your research from any institution or organisation at which your research is being conducted. When the research is undertaken outside New Zealand, you need to meet all ethical, legal, and locality obligations or requirements for those jurisdictions.

Please quote the application number and title on all future correspondence related to this project.

For any enquiries please contact ethics@aut.ac.nz. The forms mentioned above are available online through <http://www.aut.ac.nz/research/researchethics>

Yours sincerely,



Kate O'Connor
Executive Manager
Auckland University of Technology Ethics Committee
Cc: shurogg@hotmail.com

Appendix B

Participant information sheet and questionnaire



Project Title

The Influence of Artificial Intelligence (AI) on the Quality of Customer Service in Banking: how does the robotic artificial intelligence influence the customer's perceptions regarding the quality of services a bank offers.

An Invitation

My name is Shrooq Salem Alharbi. I am a Master of Business (Marketing) Student at Auckland University of Technology in Auckland, New Zealand. I would like to invite you to participate in this experiment to share your thoughts regarding your experience of banking services.

What is the purpose of this research?

The purpose of this research is to investigate how does humanoid robotics influence customer's perceptions of service quality in the banking sector. This research will help me in my completion of my Master of Business (Marketing) qualification. Additionally, the findings of this research may be used for academic publications and presentations.

How was I identified and why am I being invited to participate in this research?

The researcher will go into Master of Marketing and Bachelor of Business classes, hand out participant information sheets, and ask for volunteers for the experiment. When research participants arrive at the lab they be asked to sit at an internet-enabled computer, and use the computer to undertake some tasks to do with banking. One group will interact with the banks virtual assistant to assist with the task, and the other group will be able to use any online resources they like.

How do I agree to participate in this research?

You can consent to the research by completing the survey after you sign the invitation and carefully reading and understanding this information sheet. Your participation in this research is voluntary (it is your choice). You are able to withdraw from the study at any time before completing the survey.

What will happen in this research?

You will take 15 minutes to undertake an online survey regarding service quality in banking.

What are the discomforts and risks?

You will not experience any discomfort and risks by participation in this study. You can choose to stop participating in this survey at any time you would like.

What are the benefits?

You are contributing to gain insights about the influence of Artificial intelligence in enhancing the service quality in banking. Also, your contribution in this research will help the researcher to complete a Master of Business qualification.

How will my privacy be protected?

No individual names or contact details will be recorded. All this information will be analysed and reported at an aggregate level that does not identify the individual responses of participants.

What are the costs of participating in this research?

About 15minutes approximately will be required.

What opportunity do I have to consider this invitation?

You have one week to consider this invitation.

Will I receive feedback on the results of this research?

You may email the researcher (Shrooq Alharbi) for any feedback or a summary of the research findings. (Researcher's email fjk0872@autuni.ac.nz)

What do I do if I have concerns about this research?

Any concerns regarding the nature of this research should be notified in the first instance to the research Supervisor, Assoc Prof. Ken Hyde, Ken.Hyde@aut.ac.nz, (64) 9 921 9999 ext 5605.

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTEK, Kate O'Connor, ethics@aut.ac.nz , (64) 9 921 9999 ext 6038.

Whom do I contact for further information about this research?

Please keep this Information Sheet for your future reference. You are also able to contact the research team as follows:

Researcher Contact Details:

Shrooq Salem Alharbi email: fjk0872@autuni.ac.nz

Project Supervisor Contact Details:

Assoc.Prof. Ken Hyde, ken.hyde@aut.ac.nz, (64) 9 921 9999 ext 5605

Approved by the Auckland University of Technology Ethics Committee on type the date final ethics approval was granted, AUTEK Reference number type the reference number.

Project Title

The Influence of Artificial Intelligence (AI) on the Quality of Customer Service in Banking: how does the robotic artificial intelligence influence the customer's perceptions regarding the quality of services a bank offers.

An Invitation

My name is Shrooq Salem Alharbi. I am a Master of Business (Marketing) Student at Auckland University of Technology in Auckland, New Zealand. I would like to invite you to participate in this experiment to share your thoughts regarding your experience of banking services.

Confidentiality and Privacy

All information you provide to us as part of this survey will be kept strictly anonymous. We take our privacy and our compliance with the Privacy Act 1993 seriously. We will keep the information you provide to us secure. Your responses to our questions will only be presented or published to third parties or the public in an aggregated and anonymised form, and no individual results which identify you will be disclosed to the public. The demographic information that I ask you to provide at the beginning of the questionnaire will be used for comparative purposes only. If at any time you wish to withdraw from the survey you will not be disadvantaged in any way.

Consent

Your consent to participate in this research and providing your information on the terms above will be confirmed by completing the following, electronic questionnaire.

Shrooq Salem Alharbi
Fjk0872@autuni.ac.nz

What is your gender?

- ☐ Male
☐ Female
-

Which of the following categories describe your age?

- ☐ 18-24
☐ 25-34
☐ 35-44
☐ 45-54
☐ 55-60
-

The following statements relate to your feelings about the service provided by the bank.
Please show the extent to which you believe this service provided has the feature described
in each statement.

Please indicate your level of the agreement with the statement listed below

	Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree
1: This bank has up-to-date equipment.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2: This bank's physical facilities are visually appealing.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3: This bank's appearance is in keeping with the type of the service provided.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4: When this bank promises to do something by a certain time, it does so.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5: When you have a problem, this bank is sympathetic and reassuring.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6: This bank is dependable.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7: This bank provides its services at the time it promises to do so.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8: This bank keeps its records accurately.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9: This bank does not tell customers exactly when the service will be performed.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10: You do not receive prompt service from this bank.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11 This bank is not always willing to help customers.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12: This bank is too busy to respond to customer requests promptly.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13: You can trust this bank.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14: You feel safe in your transactions with this bank.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15: This bank is polite.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

16: This bank does not give you individual attention.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17: This bank does not give you personal attention.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18: This bank does not know what your needs are.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19: This bank does not have your best interest at heart.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20: This site makes it easy to find what I need.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21: This bank does not have your best interest at heart.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22: It makes it easy to get anywhere on the site	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23: It enables me to complete a transaction quickly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24: Information on this site is well organized	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25: This site loads its pages fast	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26: This site is simple to use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27: This site enables me to get on to it quickly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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28: It protects information about my web-behaviour	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
29: It does not share my personal information with other sites	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
30: This site protects my personal information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How satisfied are you overall with the service you received?

Displeased me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Pleased me
Disgusted with the service	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Contented with service
Very dissatisfied with service	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very satisfied with service
Did a poor job for me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Did a good job for me
Unhappy with the service	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Happy with service
Bad value	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Good value
Frustrating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Enjoyable
Very unfavourable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very favourable

Appendix (C)

Result of exploratory factor analysis of the service quality measurement

Factor	Total Variance Explained								
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	11.516	39.710	39.710	11.234	38.740	38.740	5.532	19.074	19.074
2	3.933	13.563	53.273	3.641	12.554	51.293	4.955	17.087	36.162
3	2.344	8.081	61.354	2.064	7.118	58.411	4.495	15.500	51.662
4	1.858	6.407	67.761	1.646	5.677	64.088	2.810	9.690	61.352
5	1.247	4.301	72.062	.958	3.302	67.390	1.676	5.780	67.132
6	1.009	3.480	75.542	.661	2.280	69.671	.736	2.539	69.671

Appendix (D)

Rotated component matrix for the service quality measurement

Rotated Component Matrix ^a						
	Component					
	1	2	3	4	5	6
This bank has up-to-date equipment.						.612
This bank's physical facilities are visually appealing.					.719	
This bank's appearance is in keeping with the type of the service provided.					.825	
When this bank promises to do something by a certain time, it does so.			.700			
When you have a problem, this bank is sympathetic and reassuring.			.584			
This bank is dependable.			.746			
This bank provides its services at the time it promises to do so.			.795			
This bank keeps its records accurately.			.667			
This bank does not tell customers exactly when the service will be performed.		.683				
You do not receive prompt service from this bank.		.783				
This bank is not always willing to help customers.		.764				
This bank is too busy to respond to customer requests promptly.		.804				

You can trust this bank.			.686			
You feel safe in your transactions with this bank.			.629			
This bank is polite.						
This bank does not give you individual attention.		.762				
This bank does not give you personal attention.		.864				
This bank does not know what your needs are.		.765				
This bank does not have your best interest at heart.		.780				
This site makes it easy to find what I need.	.707					
It makes it easy to get anywhere on the site	.701					
It enables me to complete a transaction quickly						
Information on this site is well organized	.862					
This site loads its pages fast	.830					
This site is simple to use	.876					
This site enables me to get on to it quickly	.782					
It protects information about my web-behaviour				.703		
It does not share my personal information with other sites				.900		
This site protects my personal information				.838		

Appendix (E)

Independent samples *t*-test for H1

Group Statistics					
	Use of virtual assistant (Jamie) or not?	N	Mean	Std. Deviation	Std. Error Mean
APPEARANCE	no	30	2.2333	.85836	.15671
	yes	30	2.0000	.64327	.11744
Reliability	no	30	2.3476	.87557	.15986
	yes	30	2.3143	.82313	.15028
Responsiveness	no	30	4.8333	1.08046	.19726
	yes	30	4.5125	1.35918	.24815
Efficiency	no	30	2.4611	1.00543	.18357
	yes	30	2.2889	.91699	.16742
Privacy	no	30	2.6667	1.06853	.19509
	yes	30	2.5111	1.16373	.21247

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
APPEARANCE	Equal variances assumed	2.539	.117	1.191	58	.238	.23333	.19584	-.15868	.62535
	Equal variances not assumed			1.191	53.763	.239	.23333	.19584	-.15934	.62600
Reliability	Equal variances assumed	.001	.974	.152	58	.880	.03333	.21941	-.40586	.47252
	Equal variances not assumed			.152	57.780	.880	.03333	.21941	-.40589	.47256
Responsiveness	Equal variances assumed	.120	.731	1.012	58	.316	.32083	.31700	-.31372	.95539
	Equal variances not assumed			1.012	55.192	.316	.32083	.31700	-.31441	.95607
Efficiency	Equal variances assumed	.202	.655	.693	58	.491	.17222	.24845	-.32510	.66954
	Equal variances not assumed			.693	57.515	.491	.17222	.24845	-.32518	.66963
Privacy	Equal variances assumed	.007	.933	.539	58	.592	.15556	.28845	-.42183	.73294
	Equal variances not assumed			.539	57.583	.592	.15556	.28845	-.42192	.73303

Appendix (F)

Independent samples *t*-test for H2

Group Statistics					
Use of virtual assistant (Jamie) or not?		N	Mean	Std. Deviation	Std. Error Mean
SATISFACTION	no	30	5.6292	.83012	.15156
	yes	30	5.7125	1.31066	.23929

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
SATISFACTION	Equal variances assumed	2.395	.127	-.294	58	.770	-.08333	.28325	-.65032	.48365
	Equal variances not assumed			-.294	49.041	.770	-.08333	.28325	-.65254	.48587

Appendix (G)

Two-way ANOVA to test gender as moderator for H1

Tests of Between-Subjects Effects						
Dependent Variable: APPEARANCE						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1.250 ^a	3	.417	.709	.551	.037
Intercept	268.817	1	268.817	457.097	.000	.891
Gender	.017	1	.017	.028	.867	.001
virtual_assistant	.817	1	.817	1.389	.244	.024
Gender * virtual_assistant	.417	1	.417	.709	.404	.012
Error	32.933	56	.588			
Total	303.000	60				
Corrected Total	34.183	59				

a. R Squared = .037 (Adjusted R Squared = -.015)

Tests of Between-Subjects Effects						
Dependent Variable: Reliability						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.404 ^a	3	.135	.182	.908	.010
Intercept	326.000	1	326.000	439.969	.000	.887
Gender	.370	1	.370	.500	.482	.009
virtual_assistant	.017	1	.017	.022	.881	.000
Gender * virtual_assistant	.017	1	.017	.022	.881	.000
Error	41.494	56	.741			
Total	367.898	60				
Corrected Total	41.898	59				

a. R Squared = .010 (Adjusted R Squared = -.043)

Tests of Between-Subjects Effects

Dependent Variable: Responsiveness

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1.603 ^a	3	.534	.342	.795	.018
Intercept	1310.169	1	1310.169	839.768	.000	.937
Gender	.059	1	.059	.038	.847	.001
virtual_assistant	1.544	1	1.544	.990	.324	.017
Gender * virtual_assistant	.000	1	.000	.000	.990	.000
Error	87.369	56	1.560			
Total	1399.141	60				
Corrected Total	88.972	59				

a. R Squared = .018 (Adjusted R Squared = -.035)

Tests of Between-Subjects Effects

Dependent Variable: Efficiency

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.550 ^a	3	.183	.191	.902	.010
Intercept	338.438	1	338.438	353.616	.000	.863
Gender	.000	1	.000	.000	.983	.000
virtual_assistant	.445	1	.445	.465	.498	.008
Gender * virtual_assistant	.104	1	.104	.109	.743	.002
Error	53.596	56	.957			
Total	392.583	60				
Corrected Total	54.146	59				

a. R Squared = .010 (Adjusted R Squared = -.043)

Tests of Between-Subjects Effects

Dependent Variable: Privacy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2.511 ^a	3	.837	.667	.576	.035
Intercept	402.141	1	402.141	320.627	.000	.851
Gender	.896	1	.896	.715	.402	.013
virtual_assistant	.363	1	.363	.289	.593	.005
Gender * virtual_assistant	1.252	1	1.252	.998	.322	.018
Error	70.237	56	1.254			
Total	474.889	60				
Corrected Total	72.748	59				

a. R Squared = .035 (Adjusted R Squared = -.017)

Appendix (H)

Two-way ANOVA to test gender as moderator for H2

Tests of Between-Subjects Effects					
Dependent Variable: SATISFACTION					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.359 ^a	3	.120	.096	.962
Intercept	1929.501	1	1929.501	1553.681	.000
virtual_assistant	.104	1	.104	.084	.773
Gender	.051	1	.051	.041	.840
virtual_assistant * Gender	.204	1	.204	.164	.687
Error	69.546	56	1.242		
Total	1999.406	60			
Corrected Total	69.905	59			
a. R Squared = .005 (Adjusted R Squared = -.048)					