THE IMPACT OF SERVICE TECHNOLOGY AND INNOVATION ON CUSTOMER SERVICE: AN EXPLORATION OF CHATBOTS, VIRTUAL ASSISTANTS, AND ARTIFICIAL INTELLIGENCE

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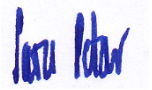

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Dedication

This thesis is dedicated to my beloved parents, whose unwavering love, support, and sacrifices have shaped every step of my journey.

To my mother, for her endless patience, encouragement, and for believing in me while keeping me grounded.

To my father, for instilling in me the values of hard work and perseverance.

I also dedicate this work to my loving wife, Deepika, and my beautiful daughters, Nayra and Nitara. Thank you for being by my side through every adventure life brings, and for your constant love and understanding.

And to all those who believed in me, even when I doubted myself - thank you for lighting my path.

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ABSTRACT

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Abstract

This dissertation examines the impact of service technology and innovation on customer service, focusing on the integration of chatbots, virtual assistants, and artificial intelligence (AI) in contemporary business environments. The study aims to explore how these technologies influence service efficiency, customer satisfaction, and organizational performance, while identifying the opportunities and challenges associated with their adoption.

A mixed-methods research approach was employed, combining quantitative and qualitative analyses to provide a comprehensive understanding of AI-driven service transformation. Quantitative data were collected from customer service operations across multiple sectors, assessing metrics such as response time, resolution rate, cost efficiency, and satisfaction indices. Qualitative data were gathered through structured interviews and thematic analysis to capture user experiences, perceptions of trust, empathy, and usability of AI-enabled service tools. The Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology

(UTAUT) frameworks guided the evaluation of user acceptance and behavioral intent toward these technologies.

The results indicate that the deployment of chatbots and virtual assistants has substantially enhanced operational efficiency and service accessibility by automating repetitive processes and enabling round-the-clock support. Customers reported higher levels of convenience and responsiveness, contributing to improved satisfaction scores. However, findings also reveal notable constraints, including limited emotional intelligence, contextual comprehension gaps, and concerns regarding data privacy and ethical governance. These limitations underscore the need for balanced implementation strategies that preserve the human element within service interactions.

The study concludes that the optimal customer service model is a hybrid configuration integrating AI technologies with human oversight to achieve both efficiency and empathy. This approach supports sustainable digital transformation while maintaining service quality and trust. The research contributes to academic and managerial discourse by providing empirical insights into how AI-driven innovation can be strategically leveraged to enhance customer experience, inform policy development, and strengthen organizational competitiveness in the evolving digital economy.

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CHAPTER 1. INTRODUCTION

1.1 Introduction

As customer service has been responsible for transformation using service technologies has become one of the most gripping elements in contemporary business innovations. Customer service has always been human-interaction based, but it has developed into a mixed system, with intelligent systems supporting human agents more and even replacing them. These platforms are chatbots, virtual assistants, and artificial intelligence (AI)-based platforms that are redefining efficiency, scalability, and personalization of customer interactions. However, in a modern digital-first economy, these technologies are not peripheral anymore but form the basis of the competitive advantage and customer experience strategies (Ngai, E. W. T., Xiu, L., & Chau, D. C. K, 2009). In this chapter, the author will present the topic, give a historical background of service technologies in the field of customer service, and outline the key role of new AI-based technologies like chatbots and virtual assistants.

The history of the development of the customer service might be reduced to a model that relies heavily on the personal, face-to-face, or telephone-mediated contacts. Before the digital age, companies invested in huge customer care desks to answer questions, complaints, and reactions. Nevertheless, this model was progressively incapable of sustaining itself in a globalized economy due to the shortcomings of scalability, time-zone restriction, and labour expenditure (Parasuraman, A., Zeithaml, V. A., & Berry, L. L., 1985). The introduction of call centers, and later email support and live chat capabilities in the 1990s and 2000s was the first wave of technology-enhanced customer service. The initial innovations enabled firms to extend the service hours, decrease the response time but they still consumed a lot of human interaction (Bitner, M.J., Ostrom, A.L. and Meuter, M.L., 2000).

A paradigm shift occurred with the introduction of service automation and AI in the 2010s. Software programs that are capable of mimicking human speech, called chatbots, started appearing on websites and social media channels, providing real-time customer service without the involvement of a human operator (Brandtzaeg & Folsad, 2017). In the meantime, the introduction of virtual assistants such as Apple Siri, Amazon Alexa, and Google Assistant offered additional means of interaction between the user and the system using natural language, further diminishing the boundary between human and machine communication (Hoy, 2018). Such trends have been accompanied by geometric advances in machine learning, natural language processing (NLP), and big data analytics, which will allow

creating more intelligent, reactive, and personalized service experiences (Huang & Rust, 2021).

Nowadays, chatbots and virtual assistants are implemented into multiple areas of customer services, such as banking, e-commerce, healthcare, education, telecommunications. As an example, the virtual assistant "Erica" used by the Bank of America works with more than 25 million customers, assisting them in orienting their accounts, conducting transactions, and getting financial advice (Bank of America, 2023). On the same note, e-commerce leaders such as Amazon and Alibaba use AI chatbots to accomplish logistics, process queries, and suggest items, dramatically decreasing the reliance on human operators without adversely affecting customer satisfaction levels (Davenport, T. H., Guha, A., Grewal, D., & Bressgott, T., 2020).

The ability of the AI-enabled service technologies to learn, adapt, and behavior in a human-like way is what makes the difference compared to the previous forms of automation. AI as it is used today examines large quantities of customer data, purchase history, customer preferences, behavioral patterns, and utilizes predictive modeling to present personalized responses. This customization plays a significant role in repeat customers and brands (Lemon & Verhoef, 2016). Moreover, AI-based technologies may work around the clock, respond to a vast number of simultaneous requests, and respond to problems faster than their human colleagues, increasing the efficiency of operations (Wilson & Daugherty, 2018).

Regardless of these benefits, the implementation of AI in customer service has its challenges as well. The loss of human touch is one of the most burning issues. Although AI is capable of performing routine duties with high accuracy, it frequently fails at complex or sensitive interactions due to the lack of emotional intelligence and empathy (Gnewuch, U., Morana, S. and Maedche, A., 2017). Automated responses can be impersonal and frustrating to customers who have peculiar issues, or who require emotional support. Besides, the privacy of data, bias in algorithms, and loss of jobs are some of the ethical issues that keep the debate about the long-term consequences of AI use in service relationships burning (Pasquale, 2015; Mittelstadt, B. D., Allo, P., Taddeo, M., Wachter, S., & Floridi, L., 2016). Regulation such as the General Data Protection Regulation (GDPR) in Europe highlights the need to protect user data as companies grow more dependent on AI-based personalization (Voigt & Von dem Bussche, 2017).

To incorporate AI and service technologies successfully into the business strategy, it is not only the technical possibilities that are needed but the preparedness of the organization. That covers re-skilling its workforce, redesigning service processes, and the culture of innovation and data literacy (Bughin, J., 2017). Bay businesses such as T-Mobile and Sephora have implemented a hybrid service model, where chatbots warn prior questions and human agents intervene in cases of escalated problems. Such a symbiotic relationship between technology and human labor is a show of a strategic equilibrium between efficiency and empathy (Accenture, 2019).

The COVID-19 pandemic additionally triggered digitalization and proved the worth of AI in serving customers. Lockdowns, employee shortages, and a spiking online presence pushed organizations to depend on chatbots and virtual agents to a greater extent to keep customer interactions afloat. A survey conducted by IBM (2020) shows that more than 60 percent of the businesses adopted AI solutions during the pandemic to increase their service capacity and minimize costs. The crisis also demonstrated the resilience and adaptability of AI during a disruption, and a lot of companies have proceeded to invest in service innovation to future-proof operations.

As related to customer perception, studies have shown that AI technologies acceptance is determined by several other constructs, such as perceived usefulness, ease of use, trust, and transparency (Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D., 2003). Older groups are normally more accepting of human interaction, whereas younger generations prioritize the benefits of speed and convenience that come with AI interaction. Conversely, the aged user group tends to seek human assistance and can be less trusting of automation (Lu, V. N., Wirtz, J., Kunz, W., 2019). Such generational and psychological dynamics require a subtle roll-out-plan that will suit different varieties of customers.

Besides, AI applications in specific industries can be more or less complex and disruptive. Virtual assistants in healthcare, such as IBM Watson, can offer patients medical information, book appointments, and manage prescriptions, but accuracy, liability, and privacy issues are of the highest concern (Topol, 2019). In hospitality, the Hilton Worldwide has adapted a robot concierge named Connie to help guests with their queries and navigation, demonstrating how AI can be used to improve the experiences of guests without eliminating the need to staff entirely (Osawa, 2016). These instances demonstrate the flexibility and the weakness of AI in different settings.

Service technology also has special economic consequences. According to McKinsey, worldwide productivity potentially created by automation across industries is estimated to reach up to 1 trillion US dollars yearly, with customer service as one of the major contributors (Chui, M., Manyika, J., & Miremadi, M., 2016). Nevertheless, employment effects have to be viewed critically. Although AI has the ability to eradicate mundane jobs, it opens up the prospect in the field of AI management, chatbot training, and data analyst. This transition should be done through careful planning of workforce and lifelong learning opportunities to prevent the marginalization of human workers (Arntz, M., Gregory, T. and Zierahn, U., 2016).

To sum up, the enhanced customer service with chatbots, virtual assistants, and AI is a complex change determined by technological opportunities, business strategy, and considerations related to socio-cultural factors. Their use is associated with unprecedented advantages when it comes to speed, cost-effectiveness and customization but also evokes significant concerns related to morals, inclusivity and humanity. As organizations go through this landscape of transformation, they should endeavor to pursue an approach that seeks to bring the best of both the human and machine potential. These dimensions will be discussed in more detail in the following chapters of this dissertation, where empirical evidence, case studies and theoretical knowledge will be introduced to evaluate the practical significance of service technology and innovation on customer service performance.

Overview of Service Technology Evolution in Customer Service

Over the last 50 years, customer service has been evolving drastically with technological advancements being a primary contributor to the changes experienced in the way business engage with customers. Customer service in its initial days had high elements of face to face interaction or landline based communication which required physical presence or staff at the customer help desk or call centers (Bitner, M.J., Ostrom, A.L. and Meuter, M.L., 2000). In the 1970s and 1980s, one of the most common systems of addressing the customer inquiries was the telephone support and direct mail systems. These traditional channels however had several limitations as they were in most cases time consuming, costly and were limited by geography and time zone (Parasuraman, A., Zeithaml, V. A., & Berry, L. L., 1985).

Service technologies have started to evolve with the spreading of telephony and Interactive Voice Response (IVR) systems in 1990s. IVR enabled customers to communicate with computerized systems through voice or keypad inputs, which tremendously minimized the

requirement of human agents, thereby, minimizing cost of operations (Xu, A., Liu, Z., Guo, Y., Sinha, V., & Akkiraju, R., 2008). At the same time, the emergence of email and web-based communication provided support models that were asynchronous, giving customers an opportunity to contact business at their convenience. Shortly afterwards was the Live chat support which provided real time digital communication but with less delays as compared to email communications (Bitner, M.J., Ostrom, A.L. and Meuter, M.L., 2000).

The trend of Customer Relationship Management (CRM) systems began to flourish in 2000s decade and organizations began to centralize customer information and customize the delivery of service (Chen & Popovich, 2003). The CRM systems became a significant stepping stone on the path of service technologies as they provided the capabilities of analytics, customer segmentation, and individual marketing approaches depending on the customer profile and buying behavior. This data centric approach formed the foundation of more intelligent types of automation and predictive service interventions (Ngai, E. W. T., Xiu, L., & Chau, D. C. K., 2009).

This transformation gathered even more pace with the introduction of the mobile technology and social media platforms in the 2010s. Businesses started to add customer care services on platforms such as Facebook Messenger, Twitter, and WhatsApp, as they realized that they had to meet customers where they were already spending their time. At the same time, the smartphone apps enabled customers to request assistance, monitor services or give feedback anywhere anytime (Van Doorn, J., Lemon, K. N., Mittal, V., 2010).

Integration of artificial intelligence (AI) and machine learning (ML) technologies in the 2010s and 2020s was, however, the most radical change. predictive modeling, sentiment analysis, and natural language processing (NLP) AI-driven systems are now able to handle a large percentage of customer interactions in a very personalized and efficient manner at scale (Huang & Rust, 2021). With businesses competing based on customer experience, the capability to provide intelligent, timely and seamless service across many touchpoints has become the most significant.

The technological aspect of services, which was previously considered as an instrument of cost reduction, is now regarded in the context of the post-pandemic digital economy as a strategic facilitator of customer acquisition, retention, and brand distinction (Deloitte, 2021). The essential role of automation, AI, and data analytics in building a customer-centric

approach has proven that technology is not an addition but a core of the contemporary customer service development.

Brief Introduction to Chatbots, Virtual Assistants, and AI in Business

Some of the recent innovations in service technology include chatbots, virtual assistants, and sophisticated AI systems, which have rapidly grown into important business operation elements. Such technologies are based on machine learning, natural language processing, and decision trees that enable them to comprehend and answer customer inquiries, mimic natural conversation, and supply real-time solutions (Gnewuch, U., Morana, S., Adam, M. T. P., & Maedche, A, 2017).

Chatbots are computer programs that simulate conversations with humans; they are either rule-based or use AI. Very early chatbots were scripted and responded to simple FAQs. However, as time went on and they were enhanced with NLP and contextual learning, they grew into intelligent agents, which were able to interpret the intent of the user and could learn based on past interactions (Brandtzaeg & Følstad, 2017). Millions of customer interactions per day in banking, healthcare, retail, and travel are being managed by AI-powered chatbots today. As an illustration, the chatbot created by H&M allows customers to search fashion items, whereas the KLM bot can assist travelers with checking the flight status and booking a ticket (Accenture, 2019).

A somewhat more ideal application of conversational AI is virtual assistants. Such systems do not just answer questions, but may also take actions on different platforms, e.g., create reminders and meetings, and order products. The most famous ones are Alexa by Amazon, Siri by Apple, Cortana by Microsoft, and Google Assistant. These assistants are based on an advanced AI model to analyze a complicated sentence, remember the user preferences, and offer individual and anticipatory service. They are being continually added to smart homes, automobiles, and business settings, evidencing both their flexibility and their escalating omnipresence (Hoy, 2018).

The emerging technologies of customer service, which include chatbots, virtual assistants, and artificial intelligence (AI), have drastically changed customer service terrain. The more digitalized and connected the world becomes, the more businesses are pushed to find new solutions that could keep up with the rising customer demands of speed, efficiency, personalization, and 24/7 availability. The technologies are not only streamlining delivery of services, but they are transforming the business-customer relationship. The intersection

between AI and the area of customer service has preconditioned the occurrence of a paradigm shift in the way businesses function and interact with their customers.

One of the most commonly used service technologies in the contemporary customer service is chatbots. They are computer programs that are used to replicate human dialogue via text-based or voice-based communication and are commonly integrated into websites, mobile applications, and social media. The most common tasks chatbots are applied to are routine customer requests (order tracking, frequently asked questions, product information and troubleshooting). The main advantage of chatbots is the fact that they can provide instant answers 24/7. Huang and Rust (2021) state that such 24/7 accessibility leads to a massive boost in customer satisfaction, as there is less waiting time, and issues can be solved immediately, which is especially helpful in international markets where time zones differ dramatically.

Besides, chatbots are more affordable compared to human-based customer service departments that have existed in the past. They are able to scale thousands of customer interactions simultaneously that otherwise would have needed a huge workforce of human agents. In terms of cost savings, Juniper Research (2020) anticipates that chatbots will save the business more than 8 billion US dollars per year by 2025. This scalability is particularly quite appealing to both startups and large enterprises. Nevertheless, the efficiency of chatbots is limited, in particular, when these systems have to respond to complicated, emotionally colored, or extremely specific requests. Here, it is also important to note that customers tend to get dissatisfied when chatbots are not able to understand the context or escalate the issues to the human agent, as Sarker, S., Chatterjee, S. and Xiao, X. (2022) remark. These drawbacks indicate the significance of creating chatbots within a hybrid support system, with routine requests being resolved by bots and more complicated problems being transferred to human representatives.

Artificial Intelligence (in its broader sense) is an umbrella term that describes a set of technologies enabling machines to emulate the cognitive processes (learning, problem-solving, decision-making, and so on). AI can do predictive analytics (e.g. churn prediction), dynamically knowledge base (e.g. natural language understanding), and real time decision support systems (e.g. natural language understanding) in customer service. As an example, the Einstein AI brought by Salesforce could recommend next-best actions to service agents to enhance resolution times and customer satisfaction (Salesforce, 2022). Besides,

Generative AI, such as ChatGPT created by OpenAI, has already started transforming the way companies generate content, automate processes, and even mimic human dialogue with a level of detail and continuity never seen before (Davenport, T. H., Guha, A., Grewal, D., & Bressgott, T., 2020).

The tools present some strategic benefits to the businesses. Firstly, they offer the 24/7 availability that eliminates time constraints of a human support. Two, they are cost-effective, since one chatbot can engage thousands of users in conversations in real-time without getting tired. Third, they increase uniformity and precision, eliminating the possibility of human error in high-volume service settings (Wilson & Daugherty, 2018). Notably, they are also capable of producing rich insights of data interactions that could be used in product development, marketing, and operational enhancements.

These technologies however do not come without their disadvantages. According to critics, excessively automating experiences might lead to impersonalisation and customer frustration in situations where empathy, complicated problem-solving, or cultural awareness is necessary (Gursoy, D., Chi, C. G., Lu, L., & Nunkoo, R., 2019). Moreover, the issues of data privacy and ethics about AI decision-making have been put into question. Since these systems are able to gather and process large quantities of personal information, it is necessary to introduce transparency, fairness, and adherence to regulations, such as GDPR (Mittelstadt, B. D., Allo, P., Taddeo, M., Wachter, S., & Floridi, L., 2016; Voigt & Von dem Bussche, 2017).

Still, adoption in the industry is increasing. According to a report by Gartner (2023), through 2027, 25 percent of organizations will employ conversational AI in every customer-facing channel. What is more, by 2030 AI-based customer service systems will help to cut operational costs by up to 30 percent in such industries as telecoms, insurance, and financial services (McKinsey, 2021).

A customer-wise view of user acceptance is determined by numerous aspects, such as the perception of ease of use, trust, usefulness, and emotion and intent understanding ability of the system (Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D., 2003; Lu, V. N., Wirtz, J., Kunz, W., 2019). The companies also need to be mindful of human-centered design and must be assured that the AI systems should not disrupt the meaningful customer relationships but rather complement them.

To sum up, the emergence of chatbots, virtual assistants, and AI is a meeting point of technological creativity and business imperative. Digital-native consumers are expecting

services to be faster, smarter, and more intuitive, which means that these tools will be at the center of defining customer expectations and business performance. Chapters of this dissertation will further discuss these technologies at work, based on case studies, their performance measures, and user reactions, discuss the usefulness and drawbacks of the technologies in contemporary service ecosystems.

Importance of Studying Their Impact on Customer Experience

The addition of chatbots, virtual assistants, and artificial intelligence (AI) to customer service ecosystems is not only changing how operations are conducted but the very context of customer experience (CX). With the increased ubiquity of these technologies, it would appear that knowledge of their effect on customer perceptions, expectations and satisfaction would become not only relevant, but necessary. Product differentiation is no longer a main factor of competition among businesses as the quality of customer interaction is (Lemon & Verhoef, 2016). Here, technology is not behind the scenes any more: it is on the stage of customer experience orchestration.

Customer experience refers to the sum of interactions a customer has with a brand, including discovery, use, and after sales service. The use of technologies such as chatbots and virtual assistants powered by AI is becoming a part and parcel of this journey as the initial engagement mechanism, problem solvers, and even relationship managers in certain instances. The speed of their responses, 24-hour service, and personalization based on the data they gather plays a major role in customers forming opinions about the quality of service (Huang & Rust, 2021). Indicatively, Sephora and Spotify have been able to embrace AI to personalize experience and go beyond satisfying user needs to generating delight, which is a crucial loyalty catalyst (Accenture, 2019).

But it is not only efficiency that can define customer experience. It is also important through emotional involvement, trust, empathy and human-like comprehension. Although AI technologies are capable of mimicking some of these aspects through sentiment analysis and natural language processing, they tend to fail to match the level of human empathy and understanding of the context (Gnewuch, U., Morana, S., & Maedche, A., 2017). Therefore, it is likely that, even admitting the speed and convenience of automated systems, customers will still miss human contact in more subtle or emotionally intense situations (Gursoy, D., Chi, C. G., Lu, L., & Nunkoo, R., 2019).

The examination of AI effects on the customer experience is especially required because of the difference in user expectations based on demographics and cultural backgrounds. Such demographics as younger consumers, will tend to be more receptive to engaging with digital agents and appreciate the convenience of self-service. Conversely, less digitally literate customers (or older customers) might perceive AI as impersonal or even frightening (Lu, V. N., Wirtz, J., Kunz, W., 2019). It is with this differences in mind that without an in depth knowledge of these differences businesses face the very real prospect of alienating entire regions of the customer base or mal-investing resources.

In addition, AI-based service tools amass large quantities of user data to operate successfully. It puts ethical concerns regarding transparency, consent, and data use in play, which affect customer trust, a vital contributor to long-term satisfaction and engagement (Mittelstadt, B. D., Allo, P., Taddeo, M., Wachter, S., & Floridi, L., 2016; Voigt & Von dem Bussche, 2017). The irony here is that, although personalization translates into satisfaction, the data practices needed to support it could, at the same time, destabilize trust unless carried out conscientiously.

In addition to chatbots, virtual assistants (VAs) have also become a new generation of highly advanced tools capable of more personalized and contextual customer service. Virtual assistants, contrary to simple chatbots, are powered by sophisticated AI, natural language processing (NLP) and machine learning to understand intent, remember preferences and offer personalized responses. Examples are Siri on Apple, Alexa on Amazon, and Google Assistant that have transformed the way customers engage with digital services. At the customer service front, several companies have incorporated VAs in their mobile applications or websites as a way of getting on demand help. VAs really shine when it comes to providing personalised service suggestions, reminders and preemptive updates. As an example, in the fintech industry, virtual assistants are employed to notify the client of an irregular account usage, an upcoming bill payment or spending pattern, thus creating a more interactive and trust-focused relationship (Kumar, A., Dixit, A., Javalgi, R. G., & Dass, M, 2019).

Moreover, virtual assistants can be very important in facilitating omnichannel customer service. Virtual assistants ensure continuity and consistency as customers engage with brands on many different platforms: websites, apps, and call centers as well as smart devices like phones and speakers. They are able to access the history and preferences of a customer irrespective of the platform he/she was using and make the service encounter smooth.

McLean and Osei-Frimpong (2021) underline that this kind of integration is essential to improve customer loyalty in particular in industries such as retail and hospitality where customers expect a high level of convenience and personalization.

The overall involvement of artificial intelligence into the customer service is not confined to chatbots and virtual assistants. AI is currently integrated into analytics platforms, decision-support systems, and customer relationship management tools to create efficiency and increased insight. Predictive analytics can be deemed as one of the most influential AI uses as it implies analyzing past customer data to make predictions about the future. As another example, AI can recognize trends that a customer will churn and be able to preemptively start retention efforts. Paschen, J., Pitt, C., & Kietzmann, J. (2020) consider that predictive analytics enables companies to transition to proactive, as opposed to reactive, customer service and this has a remarkable impact on customer satisfaction and retention.

One more knowledge management and information retrieval is another field where AI can make a significant contribution. AI can also keep customer service reps informed, surfacing the most useful documents or resolution to a live interaction, thereby cutting response time and jacking up first-contact resolution rates. This type of cognitive support is able to make customer service a strategic robot instead of a reactive role. Nevertheless, ethical issues associated with AI integration are also linked with transparency, data privacy, and bias in algorithms. Floridi, L. (2018) emphasise the need to have ethical governance frameworks in place, which provide transparency, security and accountability of the AI systems, especially when processing sensitive customer information.

These technologies have also led to organization and cultural adjustments within parties providing customer services. Instead of destroying work, AI and automation are being applied more and more to enhance human performance. Repetitive tasks and rules-based tasks are handled by the machines, and human agents take on the emotionally complex or high-stakes or judgment-requiring problems. Such division of labor ensures not only the increase of efficiency but also promotes job satisfaction among the human agents who do not have to cope with routine work anymore (Davenport & Ronanki, 2018). As a result, service design processes are being re-imagined to develop collaborative work-flows in which AI and human beings are synergetic.

Thus, the investigation of the role of service technology on customer experience is a complex activity. It does not settle with the measures of performance like response time or resolution

rate but needs the psychological aspects like perceived control, emotional satisfaction and trust. Moreover, due to the high rate of technological development and the introduction of generative AI tools, it is necessary to conduct ongoing research to monitor the changes in customer expectations and experience over time. This is not an academic understanding only, it is a strategic necessity to businesses that want to stand out in a crowded market.

1.2 Research Problem

Current Gaps in Understanding How AI-Driven Tools Affect Customer Satisfaction

As the list of technological capacities of AI in customer service grows in literature, the actual knowledge of its practical application in customer satisfaction leaves much to be desired. A lot of the available literature is devoted to efficiency improvement or cost saving through the prism of business (Davenport, T. H., Guha, A., Grewal, D., & Bressgott, T., 2020). There is less focus on the subjective experience of the customer, such as whether they feel listened to, understood, and respected in AI-mediated interactions.

Customer satisfaction is multi-dimensional and depends on a combination of utilitarian and affective issues. An AI chatbot can give a good answer fast, but it might not necessarily know the difference between the emotional components of a complaint or the urgency of a request. This loss of touch may cause dissatisfaction even in a situation when the problem is solved technically (Gnewuch, U., Morana, S., & Maedche, A., 2017). In addition, satisfaction is commonly quantified with regard to short-term responses, including post-interaction surveys, which potentially fail to reflect long-term interest and brand allegiance.

Lack of comparative studies across service contexts is also another gap that is critical. The success and acceptability of AI applications can be night and day in different industries in healthcare, banking, retail, and hospitality. To give a few examples, a virtual assistant in the banking sector can be valued in terms of efficiency and security, whereas in healthcare, the same technology can trigger empathy, accuracy, and trustworthiness concerns (Topol, 2019). The lack of sector-specific knowledge will make organizations implement AI strategies that do not align with the expectations of customers and service requirements.

Also, the potential of AI to create personalization is widely proclaimed, but the empirical evidence on the effect of personalization on a large scale satisfaction is scant. Does an AI tool need to preventing says and purchase history of a customer, or should it also identify a tone, urgency, and favored communication style? These are questions that have received insufficient attention in the academic and industry studies.

Challenges in Implementation (e.g., Human-AI Interaction, Privacy Concerns)

The use of AI tools to serve customers is an implementation that does not come without big challenges specifically concerning the human interaction with AI, privacy, and ethics. A lack of transparency in the operation of AI systems is one of the most urgent issues. Most customers do not know that they are talking to a bot or a human being, and it may be confusing or make them feel deceived (Lu, V. N., Wirtz, J., Kunz, W., 2018).

In instances where customers are aware, the quality of the interaction is in most cases poor because of the drawback in the conversation abilities of AI. Such failures as incorrectly understanding the user request, the inability to realize sarcasm or emotion, or provide the wrong answer can dramatically break the customer relationship (Brandtzaeg & Flevstad, 2017). When this happens, dissatisfaction pays the price of promised efficiency.

The other issue is the integration of AI and human assistance. Automation of routine jobs and human beings to handle complex cases is frequently seen as the most efficient customer service models. But an express handoff of a conversation between a chatbot and a human agent without losing context or repeating information is currently a technological challenge (Accenture, 2019). Ineffective handoffs introduce friction into the customer experience and eliminate the value of automation.

Another essential issue is data privacy. In order to work properly, AI instruments have to access extensive datasets, which may gather sensitive personal data. Providing data security, ethical use of data, and regulating data processing in accordance with such regulation as GDPR is not only a technical but also an organizational task (Voigt & Von dem Bussche, 2017). Data breaches or misuse might critically damage customer trust and put companies at risk of legal and reputational consequences.

These technologies have brought revolution in the real world as depicted in several examples. H&M is a multinational fashion company that implemented AI-driven chatbots to offer individual fashion advice through the browsing and shopping history of a customer. Not only does this improve the customer experience, but it also leads to increased conversion rates and average order values. The additional strong example is the virtual assistant of the Bank of America named Erica, which offers various banking functionalities such as budget monitoring, account balances, and fraud notifications within a conversational user interface. The success of AI-driven customer engagement is evident since Erica has acquired more than 15 million users since its launch (Bank of America, 2022).

Moving forward, it can be anticipated that further developments in the AI will result in even more dynamic and emotionally intelligent customer service solutions. Digital interactions will be humanized further through emotion-recognition technology; adaptive learning algorithms; multimodal interaction interfaces (that integrate voice, text and visual cues). It is important however that organizations exercise caution so as not to over-automate their processes as this may lead to impersonal or frustrating customer experiences. Indeed, to establish meaningful customer relationships, as Gnewuch, U., Morana, S., Adam, M. T. P., & Maedche, A. (2022) note, a balanced solution that incorporates the rapidity and scale of AI with the empathy and intuition of human agents is needed.

To sum up, the current territory of customer service in business is being transformed by service technology and innovation, such as chatbots, virtual assistants, and AI. Such tools have unmatched advantages of speed, cost-effectiveness, customization, and scale. However, the key to their success will be careful introduction, ethical control, and the desire to keep the human element when interacting with customers. A combination of technology capacity and human understanding will help organizations provide efficient customer service that is emotionally evocative and technology savvy of the future.

Moreover, institutional imperfections to the use of AI can frustrate implementation. Workers can be afraid of losing their positions, and leaders can be neither skilled nor ambitious enough to employ AI in a meaningful way. The potential of the AI cannot be fully achieved without proper training and change management (Bughin, J.., 2017).

1.3 Purpose of Research

With the invention and continuous development of technology, it has become a major pillar with the aid of which organisations are reinventing their customer engagement process. With the spread of digital transformation in the service industry, such instruments as chatbots, virtual assistants, and the wider implementation of artificial intelligence (AI) have become seen as a way to improve customer experience and manifest better service delivery rates and new patterns of engagement. In this context, this study aims at investigating the triad of chatbot technology, virtual assistants, and AI to determine their growing role in customer service, their performance and drawbacks, and the way customers view these novelties. The value of the study is also reflected not only in the contribution to the current academic debate but also in its practical implication to the business and policymakers involved in digital transformation processes.

The primary aim of the study is three-fold. First, it is expected to critically examine the role that chatbots, virtual assistants, and AI-driven technologies have in contemporary customer service settings. These tools are not simply an additional support channel but are being put more and more to the fore as customer relationship management agents. One such area is chatbots that are no longer limited to simple rule-based programs but have evolved into advanced natural language processing (NLP)-driven agents that can handle complex requests and maintain context-aware dialogues (Xu, A., Liu, Z., Guo, Y., Sinha, V., & Akkiraju, R.., 2017). Even consumer devices like Amazon Alexa or business service interfaces like Apple Siri have become virtual assistants that further erase the boundary between human and machine support. The paper researches how these tools are integrated in their operation and how widely they are employed in such fields as e-commerce, banking, healthcare, and telecommunication.

Second, the study determines the efficiency and effectiveness of such technologies in managing customer service tasks. The key performance indicators can be the metrics that measure response time, information accuracy, the rate at which queries are resolved, and customer satisfaction. Although most organisations claim that AI-based solutions have helped them to reduce costs and speed of the service provided (Chatterjee, S., Rana, N. P., Tamilmani, K., & Sharma, A, 2020), the qualitative side of interactions, including empathy, ability to understand a context, and flexibility, are questionable. The study explores these dichotomies and presents the quantitative data of the previous researches along with the qualitative information based on the experience of customers and employees.

The third and essential part of the research purpose is to evaluate the perceptions and feelings of customers regarding such technologies. The most technically advanced systems can fail to work in case they are not matched with user expectations. Research has depicted that acceptance of AI-based tools is strongly determined by customer trust and perceived usefulness (Gursoy, D., Chi, C. G., Lu, L., & Nunkoo, R., 2019). There are users who value the instantaneity and around-the-clock accessibility of chatbots, and there are those who are annoyed by their restrictions, especially in situations that are complex or emotionally involving. This research will attempt to give a broad description of user acceptance and resistance factors by gathering and analysing customer feedback on the subject either through secondary means of examination of existing data or through primary methods of surveying and interviewing.

Collectively, the goals lead to a point where they provide practical recommendations to organisations considering or already implementing AI-based customer service applications. As we move to a competitive market in which customer experience is a primary point of differentiation, it is crucial to realize the subtle performance and reception of service technologies. The knowledge gained or generated during this research is likely to be used in technology selection criteria, implementation plans, employee training plans and customer education.

1.4 Significance of the Study

The value of the study may be evaluated in terms of three major aspects: academic contribution, practical relevance, and policy implications. From scholarly point of view, the study fits into the ever-expanding literature about the connection among service innovation, human-computer interaction, and artificial intelligence. On the one hand, there is an ample amount of theoretical research on AI and customer service respectively; on the other hand, there is a lack of integration research that would study chatbots, virtual assistants, and general AI in the same analytical framework. If these strands are brought together, the study contributes conceptual clarity and empirical richness to the way service technologies co-evolve with organisational requirements and customer demands. The presence of behavioural theories, including Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT) also provides the analysis with the foundation of the well-established theoretical constructs to make the academic discourse more nuanced.

Besides, the research has practical significance to business practitioners. With the emerging digital service channels everywhere, firms are mounting pressure to integrate technologies that can help them to be more responsive and cut operation cost, and scale customer response without sacrificing quality. Nevertheless, the fast development of AI solutions also caused confusion and variation in the implementation success. This research can offer a guideline to businesses looking to embark on the rocky path of AI implementation in customer service by systematically identifying best practices, performance benchmarks, and user feedback trends. As an illustration, companies will be able to discover how to customise the chatbot interface to the tone and intricacy of their service area, or even how to combine human and machine interactions in a manner that would maximise customer satisfaction.

The other important practical implication concerns the staff roles and organisational design. With the routine queries and transactions handled by AI systems, human customer service

representatives are frequently reassigned to the high-complexity or high-emotion interactions. This two-fold division of roles requires shifting the training, performance measurement, and job satisfaction models (Huang & Rust, 2018). The information obtained in this research could guide managers to make a more effective transition planning, pinpointing the areas that AI is clearly superior and those where the human element cannot be substituted.

The policy implications are of equal importance as well, particularly in a time where the deployment of ethical AI and data governance are at the forefront of the popular imagination. As AI tools process large amounts of personal and transactional data, the issue of privacy, transparency and accountability have become central. Ethical considerations and regulatory frameworks like the General Data Protection Regulation (GDPR) in the European Union and the developing AI governance systems in nations, including the U.S., Canada, and India, indicate the necessity of ethical standards and enforcement systems. This study will seek to inform this policy discussion by highlighting regulatory gaps, standards that define transparency in AI communications (clear disclosures when humans are communicating with bots), and procedures that can establish protection of sensitive data.

The other urgent issue is the bias in algorithms when AI models learn on biased data they provide discriminatory or inconsistent output. To take a few examples, when a virtual assistant incorrectly understands the requests of non-native speakers disproportionately or underrepresents some dialects, it violates not only equity but also usability (Crawford, 2021). This paper illustrates these dangers and proposes inclusive data training practices, frequent audits, and user feedback loops as some of the ethical AI implementation measures. The policy suggestions would be applicable especially to the services in the public sector and such regulated fields as healthcare and finance.

In addition to ethics, the study also proposes governments and industry organizations to assist small and medium-sized enterprises (SMEs) in digital transition processes. Large corporations may easily experiment with and optimise AI tools whereas small firms are constrained by resources as well as the problem of technological inertia. The research hence points at the necessity of enabling ecosystems, such as subsidised training, vendor certifications, and open-source toolkits that would democratise access to service innovation.

More than that, due to the pandemic-driven rush in digital transformation, the focus of the study has become more topical and impactful. The switch to online customer service infrastructures became more critical as the physical branches and in-person communication

became less dominant during COVID-19. Virtual assistants and chatbots were extremely helpful in terms of handling customer anxiety, spreading real-time updates, and maintaining service continuity in fields like travel, health, and banking (Baudier, P., Ammi, C. and Deboeuf-Rouchon, M.., 2021). Some technologies were resilient and scaleable, but others hit a wall or did not meet the expectations of users, demonstrating the essential considerations to make to be resilient and design systems. These post-pandemic considerations constitute a valuable stratum of the study value, in particular, the ready-ness of businesses to new disruptions.

Overall, the given research has a complex goal: on the one hand, it aims at unpacking the changing roles of chatbots, virtual assistants, and AI in the modern customer service setting, evaluating their advantages and disadvantages and learning more about the way users perceive and communicate with them. Its importance cuts across academic enrichment, business strategy making and public policy making. The combination of theoretical frameworks, empirical evidence, and stakeholder views allows the study to become, hopefully, a valuable and versatile tool used by all of the actors that have to deal with the digital customer service environment.

1.5 Tentative Research Purpose and Questions

The research is guided by three core questions.

RQ1: How do chatbots improve response efficiency in customer service? This question investigates the operational benefits of chatbots in terms of speed, cost-reduction, and scalability.

RQ2: What are the key advantages and limitations of virtual assistants? This explores the functionalities of voice and text-based virtual assistants, focusing on their role in personalization, contextual engagement, and service continuity.

RQ3: How does AI-driven personalization impact customer loyalty? This addresses how machine learning and predictive analytics influence repeat patronage and emotional connection with brands. Together, these questions aim to provide a comprehensive understanding of the evolving digital service ecosystem and contribute insights into strategic adoption and optimization of AI-enabled tools in customer-facing roles.

Chapter II: REVIEW OF LITERATURE

In the previous chapter of the study, the evolution of service technology, an understanding on Chatbots, Virtual Assistants, and AI in business, its significance on customer experience have been discussed in a detailed manner. In this chapter of the study, the relevant findings of the existing studies in context to associated theoretical framework, customer service and innovation and applicable case studies as identified in the existing studies will be elaborated in this section of the study.

2.1 Theoretical Framework

- **Technology Acceptance Model (TAM) and Diffusion of Innovations Theory**

According to the review conducted Schorr (2023), the researcher has focused on analyzing the technology acceptance model [TAM] and its significance in digitalization research. It has been opined by the researcher in this regard that TAM plays a pivotal role in studies focusing on acceptance of digital technologies. Referring to the work of Davis (2015), the researcher stated that initially studies focusing on technology acceptance were having high failure rate of information technology applications and number of software companies were making major financial losses resulting from systems that were rejected. It has been stated that Davis was the first person to address the topic of user reactions to digital technologies. The aim was to identify the ways in which system design characteristics impacts user motivation. The TAM model was formulated with the intention to provide the theoretical basis for practical user acceptance. The original theory on technology acceptance was simple in terms of the structure. It was identified that there are two major reasons for the rejection of a new system, which includes perceived ease of use and perceived usefulness of the technology that acted as the guiding factor for further research in this arena. The mentioned two beliefs forms the basis for the attitude, that is, attitude toward using the technology, which is followed by a behavioural reaction, which is the actual use of the technology, the ways in which, users are motivated to use the system. In this review, referring to the work of Davis, the researcher further discussed on the extensions of TAM. The study has been effective in providing a detailed understanding of the theoretical basis of TAM which can be regarded as strength of

this study. However, majority of the observations presented have been based on existing literatures, exposing the mentioned findings to the risk of publication bias.

In this alignment, in order to get further clarity on the components of TAM model, the review by Marikyan and Papagiannidis (2024), is also required to be analyzed here. In this review, the researchers focused on analyzing the elements of TAM model in a detailed manner. In the opinion of the researchers, in according to the TAM model, the process of technology acceptance is a three-stage process in which, external factors for instance, system design features result in triggering cognitive responses perceived usefulness and perceived ease of use that in turn formulates an affective response, that is, attitude toward using technology or intention, which results in impacting the use behavior among the users towards the acceptance of the technology. According to the researcher, TAM represents the behavior as the result predicted by perceived usefulness, perceived ease of use and behavioral intention. Perceived usefulness and perceived ease of use captures the belief that behaviour will not be labour-consuming and the expectations of positive behavioural outcomes. Referring to the follow up study, the researcher also stated in the review that the attitude toward behavior can substitute behavioural intention, which is an affective evaluation of the potential consequences of the behavior. The higher the affective response would indicate higher likelihood of the behavior to take place. The impact of perceived usefulness on actual use can be direct, which according to the researchers highlights on the significance of the variable in predicting behavior. Referring to the work of Davis (1993), the reviewers further stated that though perceived ease of use has no direct impact on use behavior, yet it underpins the impact of perceived usefulness. It has been implied in the model that if an application or technology is expected to be easy to use, it has higher chances to be considered useful for the user along with higher likelihood to stimulate the acceptance of the technology. Along with reviewing TAM in a detailed manner, in this review, the researchers have also focused on evaluating the limitations associated with the model.

According to the Schorr (2023), for the purpose of testing the model structure of TAM and compare the prediction accuracy of TAM and Theory of Reasoned Action (TRA), Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (1989) conducted a study in which, the elements of both the models were analyzed for their applicability in predicting technology acceptance. It has been revealed in the study that there was a significant association between TRA variable user behaviour and behavioural intention. Based on the findings, it has been further determined that the major variable perceived ease of use had a direct effect on the

behavioural intention to use. On the basis of the mentioned observation it was determined that the variable; behavioural intention to use was included in the model. Thus, in TAM2 model, the variables that were considered for assessing the acceptance of a technology are perceived usefulness, perceived ease of use, attitude toward using, behavioural intention to use and actual system use. According to the researcher, in the current studies on digital technology as well, survey-based, subjective information on user behaviour is considered. Particular emphasis is usually given on the assessment of behavioural intention to use.

The researcher further assessed the evolution of TAM model. In TAM 3, the variable attitude toward using was decided to be omitted was in the previous model was one of the core elements of the TAM model. Furthermore, for the purpose of enhancing the predictability of the TAM model, according to the researcher, Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003) extended the model wherein, in the TAM2 model some of the new variables were incorporated which included, job relevance, image, subjective norm, result demonstrability and output quality. The findings of these variables demonstrated that subjective norm had impact on key beliefs. According to the researcher in TAM3 model the concept of self-efficacy can also be noticed. The TAM 3 model was presented by Venkatesh and Bala (2008) was formulated for the purpose of determining the new influence variables on the main variable of perceived ease of use. In this regard, on further analyzing the work of Venkatesh and Bala (2008), it has been noted that in this work, the antecedents of perceived ease of use and perceived usefulness were combines in a single model. In the study, the researchers have considered analyzing the association between antecedents and perception variables. The emphasis was on excluding cross-over effects. The findings of the study postulated that actual behavior associated with accepting of technology is predicted by behavioural intention, and behavioural intention is strengthened by perceived ease of use and perceived usefulness which has a set of antecedents, as already mentioned above. In this study, the researchers specified the direct predictors of perceived ease of use that includes perception of external control, computer self-efficacy, computer playfulness, computer anxiety, objective usability, and perceived enjoyment. According to the researchers, the rationale for incorporating these antecedents has its basis on human decision making. The findings of the study revealed that TAM3 is robust in explaining the use of intention and use of information system. In context to TAM 3, Marikyan and Papagiannidis (2024), have further mentioned that the model introduces 3 new moderation effects of experience on the relationships between “perceived ease of use and perceived usefulness”, “computer anxiety

and perceived ease of use" and "perceived ease of use and intention to use". In the opinion of the researchers, the primary strength of the extension is the development of the "behavioural model of antecedents of both the perception factors (perceived ease of use and perceived usefulness)". It results in providing a detailed set of conditions under which the acceptance of technology is most likely to take place. By presenting the relationships between antecedents, perceived usefulness, and perceived ease of use TAM3 provides an indepth details on the interventions which have direct impact for decision making about IT management and implementation.

In regard to the applicability of the model, referring to the works of the previous researchers, Marikyan and Papagiannidis (2024), stated that TAM and its extensions have varied range of applications in different contexts, disciplines and geographical locations. It acts as a significant theoretical tool for predicting user behaviour. Referring to the previous researches, the reviewers stated that in addition to application in the information systems management domain, TAM also finds application in other disciplines for instance advertising and marketing. Taking into account that information systems are widely used in the marketing of services and products, the researchers opined that TAM becomes an effective tool for evaluating the attitude of consumers towards technologies like e-commerce platforms, chatbots and online shopping tools. In this alignment the study conducted by Ashkanani (2017), is also worth mentioning, in which the researcher focused on analyzing the implementation of TAM in the evaluation of perspectives of instructors on e-learning in context to Kuwait University. In this research, TAM has been implemented with the aim to support the model with refined external factors that have been drawn from the environment of Kuwait University along with exploring the impact of these factors on core constructs of TAM which includes perceived ease of use and perceived usefulness. The study has also considered exploring the "implication on the outcome instructors' Attitude (ATT) toward the use of e-learning at Kuwait University [KU]". Technical Support (TS), Computer Self-Efficacy (CSE) and University Strategic Focus (USF) are the external factors which have included in the study. The researcher had implemented pragmatic methodology with mixed research approach including qualitative and quantitative approaches, in a triangulated formation of data collection. Semi-structured and unstructured questionnaires have been used as the data collection tools, using which interviews and focused group discussions have been conducted in the research. The findings from the study revealed that TAM is an applicable and valid acceptance model in case of e-learning system of the university. The outcomes of

the study has also been noted to be in alignment with the previously conducted studies on TAM in which perceived usefulness of e-learning instructors have been reported to directly impact their ATT toward the use of the system. In addition to that, the findings of the study also revealed that the perceived ease of use among the instructors found through perceived usefulness result in indirectly affecting their ATT. It has also been reported by the researchers that perceived usefulness among instructors are significantly affected by CSE, which has comparatively less impact on their perceived ease of use and indirectly so, on ATT. The findings from the study has also demonstrated that TS has a significant impact on perceive usefulness along with on perceived ease of use, though the impact on the later is in a less magnitude. It has also been stated to have indirect impact on ATT. On the basis of the qualitative findings from the study, it has been argued that USF is one of the major factors resulting in the most adverse attitude toward the use of e-learning by the instructors in the university. The underlying reason for the mentioned observation in the study is lack of motivation measures, poor policy setting and ineffective training. Based on the review of this study, it can be noticed that in this study, the findings are based on practical applications and analysis of TAM, which can be considered as a major strength of this study. However, when focusing on Kuwait University, which also has a number of non-Kuwaiti citizens with specific social and cultural differences have not been considered that may contribute to the cultural value, which can be regarded as a limitation of this study. In addition, the emphasis on Kuwait University particularly raises question in the generalizability of the findings of the study, which is another limitation of this study.

Another mentionable theory when considering acceptance of technology among users is Diffusion of Innovations Theory. In the study conducted by Avilés (2020), the researcher has considered introducing the theory of the Diffusion of Innovation [DOI], some of its research applications along with its main criticisms. According to the researcher, DOI research is based upon rational theories of organizational life adopted from management, sociology, and communication theory. It develops predictive accounts of the diffusion phenomenon which has been hypothesized to aid implementers of technology to advance the dissemination of selected technologies. The researcher opined that overall, the DOI tradition has focused on explaining individual intensions to adopt or adoption decisions, which concern the comparatively homogenous populations and concern the well-defined innovations. Referring to the work of Rogers (2003), the researcher stated that diffusion is “the process by which an

innovation is communicated through certain channels over time among the members of a social system". Thus, diffusion is considered as a particular type of communication where the participants formulate and share information with each other for the purpose of reaching mutual understanding. In the opinion of the researcher, the mentioned freshness of the idea in the message provides diffusion to its specific character, as "some level of uncertainty is thus involved". Further referring to the work of Rogers (2003), the researcher provided clarity on the definition of uncertainty, which has been defined as "the degree to which several alternatives are perceived with respect to the occurrence of an event and the relative probabilities of these alternatives". DOI, in his work, has been defined as "an uncertainty reduction process". In the work of Rogers, according to the researcher, he has proposed characteristics of innovations that are beneficial in minimizing uncertainty by obtaining more information. The researcher in his entry has further elaborated on the focus of DOI theory. Taking into account the work of Rogers, the researcher stated that the main focus of the theory is on the perceived features of technologies and the organization's innovativeness in the adoption of the technology. In the work of Rogers 5 major attributes of an innovation that impacts its adoption has been mentioned, which includes, compatibility with the organization workflows and knowledge, comparative advantage to existing technologies. trialability, complexity to implement, and observability of the development of the innovation both in the competitors and inside the organization. The perception of individuals on these mentioned 5 attributes predicts the adoption rate of the innovation. According to the researcher, an innovation-decision process model has been proposed by Rogers in order to study the stages of adoption, which is primarily an information processing and information seeking activity, where the individual is encouraged to minimize the uncertainty associated with the advantages and disadvantages of a particular innovation. With the help of the "innovation-decision process", any decision-making unit or an individual passes from first knowledge of an innovation to, developing an attitude toward it, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision". Referring to the work of Rogers, the researcher further stated that there are five steps in this process which includes knowledge, persuasion, decision, implementation, and confirmation.

During the knowledge stage, a person makes an effort to understand the nature of the innovation and its operation. An individual looks for innovation-evaluation data during the persuasion and decision-making phases to minimize doubt regarding the anticipated outcomes of an innovation. Adoption, complete utilization of an innovation as the best available course of action, or rejection is the outcomes of the persuasion stage. On the basis of work of Rogers, the researchers have further stated that, reinvention is the extent to which a user alters or modifies an innovation that can be noted during adoption and application phase. The majority of people assess innovations based on the subjective opinions of peers who have embraced them rather than on scientific studies conducted by specialists. They act as social role models whose innovative behavior is often followed by others in their system. Referring to the work of Rogers (2003), the researcher further opined that in the work of Rogers it has been stated that interpersonal channels are more effective in developing and altering attitudes toward the new idea and, which in turn result in influencing the decision to accept or reject it, mass media channels are more effective in generating knowledge of innovations.

Rate of adoption can be defined as relative speed at which members of a social system embrace an invention. A system's communication and social structure can either aid or act as a barrier in the discussion of innovations within the system. Three primary categories of innovative decisions are distinguished by him: Optional innovation refers to decisions made by an individual regarding the adoption or rejection of an innovation that are not influenced by the decisions of other members of the system; collective innovation refers to decisions made by consensus among system members regarding the adoption or rejection of an innovation; and authority innovation refers to decisions made by a comparatively small number of individuals within a system who have technical expertise, power, or status. According to Rogers, two or more of these innovation-decision kinds can be sequentially combined to form a fourth category: Only after a previous innovation-determination a decision can be made regarding whether to accept or reject it. A social system can also be used as a component in discussions about repercussions, or the changes brought about by an innovation's acceptance or rejection. "Opinion leaders" are important players in the process, according to Rogers (2003), because their opinions will have a bigger impact on those of others. According to Rogers' empirical data, in the case of costly, prominent, and radical inventions, an "innovation champion" is required to advance the technology's discussion. According to the hypothesis, the features of the innovation and the social structure around it

explain the rates of discussion. The topics of discussion are not specifically addressed by DOI models, and they rarely analyzed as to whether the technology under study has an impact.

The analysis of the work of Rogers have further revealed that in the work, members of a social system has been classified on the basis of degree to which an individual is comparatively earlier in adopting new ideas as compared to other members in a system. The range of innovativeness has been categorized into 5 categories; innovators who are the ones who introduces the innovation, early adopters, who are the one's who first implement the innovation, early majority, who are the ones who among the large group to adopt the innovation and late adopters, who adopt the innovation late. In regard to DOI, in the work of Avilés (2020), the researcher also mentioned the criticisms associated with the theory. One of the major criticisms associated with the theory according to the researcher is it is more agrarian in nature and would be of much relevance to the innovations in technological sectors. Referring to the previous studies, it has also been stated that the static nature of the adopters is another aspect of the theory, which has been questioned by business community. The underlying reason for the criticism was that, anyone can be an innovator, if the innovation is in alignment with the target for adoption of organizations. It has also been argued that the process of decision making in an organizational management is more complex in nature, than at the individual level, as elaborated in the theory, which are some of the major criticisms of the theory as stated in the review. The review of the literature reveals that the researcher has effectively provided with detailed analysis of the theory based on the researches of the previous researchers, resulting in providing a detailed understanding of the various elements of the theory. The researcher has also considered expanding on the criticisms of theory and the scope for future works in this arena. The mentioned aspects are the major strengths of this study. However it is mentionable here that considering the nature of the study, which is a review on DOI, the study has been based on the findings and observations of the previous researchers, no first hand primary information and data has been incorporated in the study, which can be considered as a limitation of this study.

AI adoption frameworks in service industries

In alignment to the focus of the present study, the frameworks for adoption of AI in service industry is also needed to be discussed in this context. Herein, in the study conducted by Yang, J., Blount, Y. and Amrollahi, A., (2024), the researchers have focused on analyzing the adoption of AI in professional service industry. The researchers have considered

implementation of multiple case study method, which have contributed in gaining a comprehensive understanding on the adoption of AI. For the purpose of gaining an understanding on the adoption of AI in professional service firms, case study approach has been used for exploring the association between the adoption of AI and its environmental context.

Based on the findings from the study, it has been opined by the researchers that the motivation for adoption of AI in context to professional service industry is impacted by various factors that are dependent on the size of the firm. For the small firms, the researchers have noted that AI affordance is superficial which result in low usage and adoption. When it comes to large firms, they are resourceful which enables them to eliminate the challenges associated with AI implementation, which in turn contributes to the adoption of AI in the firm. These organizations are structured and established for the adoption of AI. On the other hand, the researchers noted that small firms are motivated by the competition, while for large firms, stringent regulations act as a constrain. The study has its basis on Technological-Organizational-Environmental (TOE) framework. According to the researchers the framework provides a holistic perspective for gaining an understanding on the factors impacting adoption of AI. The adapted framework provides a detailed understanding into technology adoption, associating functional capabilities of the technology to the strategic visions of the firms considering its adoption. Referring to the previously conducted studies, the researchers opined that TOE provides a theoretical basis for expanding on the technology adoption at the firm level, which provides a flexible and holistic perspective on adoption of technology in firms. Referring to the previously conducted studies the researchers stated that comparative advantages of AI, compatibility and complexity are commonly highlighted under the dimension of technology. It emphasizes on the generic benefits and challenges to adopt AI along with the need for aligning with the existing systems. Continuous learning processes, interoperable datasets and data quality requirements have been reported to be some of the technology factors that are specific to the adoption of AI. In the opinion of the researchers the mentioned factors reveals the specific technological characteristics of AI and it is associated with the argument for reconsidering the conventional theorizations of technology readiness and adoption within the AI context. The factors considered in the TOE framework for the adoption of AI also include the organizational factors. In context to the organizational factor, it has been opined that it emphasizes on the significant role of leadership, specifically top management support and highlighting on the interplay between

strategic alignment and operational capacities in facilitating adoption of AI. However, it has been noted that the size of the firm in this context is a matter of debate. The researchers also opined that in some of the studies, it has been suggested that though environmental factors are not dominant in regard to adoption of AI, yet the impact of factor in a AI adoption can be noticed. It has been reported in this regard that elements like competitive intensity, government support, and environmental dynamics are integral. Taking into account the framework, when analyzing the factors impacting the adoption of AI, the findings of the study revealed that, there are primarily six factors that influence the adoption of AI in the three firms considered in the study which includes technology affordance, technology constraints, innovation management, AI readiness, regulatory environment and competitive environment. To elaborate the findings further, it has reported that from the perspective of technological domain the constraints and affordances of AI have been observed to emerge as pivotal. The innovative management of the firms underscored organizational dynamics along with their readiness to adopt AI. In the environmental front, the researchers reported that regulatory and competitive landscapes to be major determinants. In the opinion of the researchers, one of the interesting observations of the study was that, though the mentioned six factors that impact the adoption of AI have been observed consistently in the three firms chosen in the study, there was marked variations in the ways in which these factors manifested in each case. As an instance, regulatory environment as a factor impacting the adoption of AI was reported to be one of the strongest concerns over compliance with standards in the BIG firm, while in the MID firm it has been noted to be a moderate concern and for SML firm, it has been noted to be a little concern. In all the three firms considered in the study, affordances of technology have been evidently noted in all the three firms as competitive advantages provided by AI adoption. The findings of the study have demonstrated that larger firms that are planning for an in-depth and extensive AI adoption may perceive the regulatory environment as a restrictive factor. The findings of the study also revealed that there are certain constraints imposed by AI which includes lack of transparency associated with AI, data-led bias and lack of compatibility with the existing systems. Thus, based on the detailed review of the study, it can be noted that the TOE framework has been reviewed in a detailed manner in this study with significant practical contributions. The research has been contextualized within auditing making the practical implications and findings transferable to a broader array of professional service industries for instance medical and legal practices, which can be considered as a major strength of this study. The findings of this study has provided with actionable insights with regard to AI adoption readiness and

prospects, which adds up to the contributions of the study. However, the insights provided in the study are related to the adoption of AI in professional service industries, specifically in regard to auditing, resulting in questioning the generalizability of the observations, which can be considered as a limitation of this study.

In the study conducted by Alsheibani, S., Cheung, Y. and Messom, C. (2018), the researchers have considered assessing the adoption of AI, where emphasis has been given on AI-readiness at firm-level. In this regard, the researchers have aimed at proposing a framework for the adoptions of AI at the firm level, for which TOE and DOI has been considered. The arguments of the researchers associated with TOE can be noted to be in alignment with the study conducted by Yang, J., Blount, Y. and Amrollahi, A., (2024), where, referring to the work of Tornatzky, L. G., & Fleischer, M.. (1990) it has been stated that decision associated with the adoption of an innovation at the firm level is not just based on technological factors but it is also impacted by environmental and organizational contexts. Based on the mentioned observation from the study, the researchers opined that the TOE framework analyses a firm from 3 different dimensions which includes organization, technology and environment. Based on the identified dimensions, the researchers proposed a framework for AI adoption at the firm level, wherein under technological readiness relative advantage and compatibility have been considered as the factors, under organizational readiness, top management, organizational size and resources have been regarded as the impacting variables and under environmental readiness, competitive pressure and government regulatory issues have been considered as the considerable factors which may result in impacting AI adoption. As the study is a research-in-progress, the findings associated with the mentioned variables considered for the study have not been presented. Based on the review of the study, it has been noted that mixed methods research approach has been considered by the researchers for validating and testing the framework. The paper has presented with detailed interpretation of the theories considered for the study which can be considered as a major strength of the study. However, proposed methodology can be noted to lack detailed discussion on the methods and approaches using which the proposed framework will be assessed, which can be considered as a limitation of the research-in-progress.

2.2 Technology Adoption Theories

Consumer behaviour toward AI-based customer service

In alignment with the discussion on theoretical framework on AI adoption, the technology adoption theories in regard to consumer behavior is also worth discussing here. In this alignment, in the study conducted by Sohn and Kwon (2020) the researchers have focused on technology acceptance theories along with the factors impacting AI-based intelligent products. In the study, the researchers have compared technology acceptance theories in terms of AI-based intelligent products. It has been noted that Value-based Adoption Model (VAM) had the optimum performance in modeling for understanding the acceptance of AI-based intelligent products. While analyzing the model, it has been stated that TAM forms the basis of this model, where the focus in on perceived value that is derived from a technology considering its benefits and the adjustments that are needed to be made. In this model it has been proposed that the perceived benefits of a technology are weighed by users against the perceived scarifies that includes risks, efforts and costs prior forming their intention to adopt the technology. The researchers further opined that this model was proposed as an alternative model due to the failure of existing models like TAM which was not effective in considering the impacts of exogenous variables in explaining intention to use new ICT [information communication technology] along with mobile internet. According to the researchers, from the perspective of cost-benefit VAM retained the technical characteristics that included technicality and usefulness of the existing technology acceptance theories, incorporating perceived fee. Referring to the previously conducted studies, the researchers stated that VAM includes perceived values, which is not included in other models. Perceived values have been considered as mediating factor in the model in making of individual decisions, which is calculated on the basis of trade-off technology. In this study, the model has been used for elaborating on the acceptance of IPTV, mobile payments and IoT services.

Theory of Planned Behavior (TPB) is another mentionable theory, which has been considered by the researchers for explaining intention to act. In the opinion of the researchers, this theory is an extension of Theory of Reasoned Action (TRA). In TPB, the same constructs have been used when introducing the constructs of attitude and perceived behavioral control and subjective norms for explaining the intention to act. Referring to the previously conducted studies the researchers stated that subjective norms relate to the significance of social influences on acceptance that impact individual behavior. In addition, perceived behavior control that impacts individual behavior, demonstrates ease of use, contrary to perceived ease of use in TAM. The theory finds application in research on acceptance of innovative products

examining exogenous factors for instance social influence. In alignment to this, intelligent products also have various exogenous factors associated with it, which have been focused in the research.

UTAUT is another mentionable theory which has been considered in the study. According to the researcher, the theory was formulated by redefining representative technology acceptance theories, for instance TAM, TRA and TPB. Referring to the previously conducted studies, the researchers opined that the main factors which are included in the theory are effort expectancy, performance expectancy, facilitation conditions and social influence. In a similar vein, intelligent products also have several exogenous factors that have been examined in scholarly work.

The researchers have provided models and their factors based on TAM, TPB, UTAUT, and VAM in order to evaluate the usefulness of technology acceptance theories and identify the most effective model for predicting behavioral intention to use AI-based intelligent products. On the basis of the findings on adjusted R2 value, the comparison has determined that the VAM has the best predictor in the context of AI-based intelligent products. The UTAUT, TPB, and TAM have been noted to follow VAM. The relative importance of the components in each model caused differences in the prediction power of the models; enjoyment has been noted to be specifically crucial in determining which VAM was superior to the others. The UTAUT has been observed outperformed the TPB because attitude had a smaller impact, despite the fact that a number of the subjective norms category's elements were comparable. The analysis's findings supported a significantly high proportion for enjoyment, which was followed by subjective norms, PV, and usability. These findings might be explained by the fact that the spread of AI-based intelligent goods is progressing from the innovation stage to the early adoption stage, which is defined by the public's desire to learn about new technologies. It has been demonstrated that learning about a new technology is correlated with enjoyment. The next-largest percentage was attributed to subjective norms, suggesting that while AI technology is a highly intriguing concept from a social perspective, it still lacks real-world application experience, meaning that before adopting AI-based intelligent products, potential users are still influenced by the opinions of others. Based on the mentioned observation, it has been opined that even if AI technology is developing drastically along with a wide range of products, it is still in the early phases of societal acceptance, thus other people's opinions continue to be crucial in fostering trust in these

products. Indicating high user expectations for the performance and worth of AI-based intelligent devices, PV also had a significant percentage. Expectancy-value theory (Wigfield and Eccles, 2000), which describes the psychological drive for believing in and anticipating a high performance as a vital aspect for adoption, is comparable to this setting. The ratio of ease of use to PV was comparable. Although the significance of PEoU has been understated in previous technology adoption studies, a relative improvement in ease of use has been seen in the features of intelligent goods, which have developed quickly and in a variety of forms.

Based on the review of the study, it can be observed that the findings of the study have major theoretical and practical implications. The study has provided with significant information for supporting model selection for explaining the phenomenon of technology acceptance. It has also contributed to improving the cognitive structure of people AI-based intelligent products. In terms of the practical implications of the findings the study provided with major revelations for instance, enjoyment being a major factor impacting PI [purchase intention] in regard to AI-based intelligent products. The role of product designers in leveraging the influence of subjective norms has also been noted. The mentioned theoretical and practical implications of the findings of the study are some of the mentionable strengths of this study. However, much like the other studies, this research is not free from its weaknesses and limitations. For instance, the focus of the study has been on collecting data from South Korean context, which limits the generalization of the findings that can be considered as a limitation of the study.

The study conducted by Jain, V., Wadhwani, K. and Eastman, J.K., (2023) focused on analyzing the customer behavior dimensions in regard to AI interaction. Herein, the focus has been on major theories, antecedents, decisions and outcomes in AI and consumer behavior has been analyzed by the researchers. In the opinion of the researchers TPB, behavioral reasoning theory [BRT], stimulus organism response [SOR], theory of mind and self-expansion theory are the commonly used psychological theories in prevailing literatures. Referring to the previously conducted studies for instance, Sung (2021), the researchers opined that SOR framework is implemented for studying the impact of AI-powered immersive technologies on consumer behavioral intentions and engagement. BRT is applied in various studies to analyze consumer attitudes toward AI and for explaining the propensity of consumers for AI adoption. Based on the review of the existing literatures, the researchers provided themes related to AI interaction with consumers behavior dimensions which includes consumer acceptance and trust, consumer engagement and interaction, personality

and attitude, decision- making and adoption. Based on the review of existing studies, it has been revealed that interaction with AI resulted in impacting consumer behavior, where, previous studies focused on adoption and acceptance of AI-enabled technologies. With increased interaction, it has been reported to gain increased significance in the lives of consumers over time. The impact on their behavior can be positive or negative. Consumer decision making, , allowing them to make decisions in areas like shopping in a much less vulnerable state has also been reported. Consumer values, reasoning process related to the adoption, psychological traits for instance risk aversion, have been noted to impact consumer adoption of AI technologies. Consumer acceptance and trust in AI in the consumption process has also been addressed as one of the cluster. Referring to the existing studies, the researchers stated that using technologies like voice recognition, natural language processing, deep learning, image recognition, applications like music biometrics, AI service agents interact with consumers. Consumers have been reported to have mixed response towards these applications ranging from enthusiasm, apprehension, mistrust. It has also been noted that perceptions of consumers are integral in forming their behavioral intention and attitudes, which has been identified as another cluster in this study. The researchers have also considered analyzing antecedents which impacts the association that includes variables like convenience, personalization among others. The study has major practical and theoretical contributions associated with it, for instance, it provides a holistic understanding on the major theories related to AI and consumer behavior. In terms of practical contributions, it provides advises for practitioners to formulate consumer centric AI solutions, which acts as major strengths of this study. However, considering the nature of the study, the findings presented in the study has been based on observations of the previously conducted studies which exposes this study to the risk of publication bias and limits generalizability of the analysis, which can be considered as a limitation of this study.

Barriers to adoption (trust, usability, cost)

Taking into account, the discussion on theories related to technology adoption at the consumer level, the barriers associated with the adoption are also needed to be discussed. In this regard, in the study conducted by Hassan, M., Kushniruk, A. and Borycki, E. (2024), the researchers have focused on analyzing the barriers and facilitators to the adoption of AI in context to healthcare. There are primarily 18 categories of barriers and facilitators that have been identified by the researchers. The same theme has been recognized as a barrier as well as facilitators, the “same theme was tabulated as a facilitator to capture what the articles

recommended for overcoming challenges with explainability to increase adoption". The categories identified in this regard includes, transparency explainability, algorithm bias equity and fairness, functionality-accuracy usefulness, risk of harm, trust, human-AI teaming, aligning strategic components, use case-drive problem-driven AI, engagement co-design user centered approaches, workflow integration, awareness training, resources infrastructure, evaluation validation, data security data ownership data quality data availability, ethics privacy, governance, regulatory legal, funding and cost. The major findings from the study revealed that there are various factors which impact the AI adoption systems. According to the researchers, for each identified barriers there are corresponding facilitators. Based on the observations it has been opined that bias, ethics, transparency or explainability are the core considerations in developing adoption-centric and trustworthy AI systems. According to the observations of the study, trust emerged as one of the major elements of AI adoption. Based on the review, it has been revealed that trust may either impacted or facilitated by majority of the themes identified in the scoping review. It has been specifically noted that explainability, fairness, and ethics have been noted to be centerfold of barriers to AI adoption. On the basis of the review of the literatures it has been concluded by the researchers that trust among consumers are impacted by the mentioned elements that have been recognized as barriers and trust act as the major catalyst of adoption. It is further mentionable here that in regard to transparency and explainability, based on the reviewed studies the researchers opined that because of opacity of an algorithm, it may act as a barrier for clinicians from relying on ML outputs in clinical settings. It results in creating ambiguity among users on reliability among ML output and whether it can be trusted or not. In context to bias, in terms of equity and fairness, the findings of the study has revealed that algorithm bias is an integral factor in not only gaining trust but also have meaningful outputs that can be implemented to various patients. Referring to the previously conducted studies the researchers stated that bias in AI can be introduced because of algorithms being trained on the biased data, due to biased data, small training size, limitations in the model itself, lack of user participation, and other factors that are unseen. In regard to ethics, referring to the work of Gerke, S., Minssen, T. and Cohen, G. (2020), the researchers argued that there are four primary ethical challenges which are required to be addressed to realize the optimum potential of AI in healthcare that includes safety and transparency, informed consent to use, data privacy and algorithmic biases and fairness. The review of the study presented with detailed understanding on the barriers and facilitators associated with adoption of AI where the role of trust as a significant catalyst of adoption has been expanded in a detailed manner which can be regarded as strengths of this

study. However, due to the availability of limited number of studies which focused on AI adoption in healthcare section, there was small number of studies, which were reviewed in this scoping review, which can be regarded as a limitation of this study.

In the study conducted by Radhakrishnan and Chattopadhyay (2020), as well, the researchers focused on identifying the determinants and barriers of AI adoption by reviewing the existing literatures. The findings of the study revealed that at the individual level, factors like security, trust, intrinsic motivation, purchase price, utilitarian benefit and social influence are some of the factors that influence adoption of AI at the individual level. To elaborate the findings further, in context to autonomous vehicle adoption the barriers that have been identified are changes to established routines, perceived concerns, perceived risk, lack of trust, lack of accountability, privacy concerns, system failure, over reliance on AV, deprivation from the joy of driving, perceived dread and loss of driving skill. In context to cognitive engagement, it has been observed that interaction with other technologies, adaptation challenges and use for elderly people, lower communication richness and expressiveness and more complexity and ambiguity acted as a barrier for its adoption among the users. In the arena of medicine, factors like need for regulators approve the computational methods, potential risks on lives, error rates, variations between experimental and clinical data have been identified as barriers. Based on the mentioned observations, it has been opined by the researchers that at the individual level, social influence, cost, trust, performance expectancy, hedonic motivation, safety, utilitarian benefits, intrinsic motivation, prior experience with AI tools acts as determinants and barriers of AI adoption. On the basis of the review of the study, it can be noted that the findings of the study provides with detailed understanding on the various factors that promotes as well as hinders adoption of AI at individual as well as organization level. It would contribute to studying AI adoption at the level of individual consumers by understanding the interactions of the users with the AI systems. The information can be beneficial for implementing AI in organizations by knowing consumers needs and apprehensions which are major advantages of the study. The findings presented in the study have been based upon the observations of reputed journals which forms major advantages of the study. However, taking into account the very nature of the study, the observations have been based on secondary data, based on the observations of the previous researchers, which exposes it to the risk of publication bias, which can be considered as a limitation of the study.

2.3 Customer Service and Innovation

Case studies of successful AI implementations (e.g., Amazon, Zappos)

In alignment with the discussion on the various factors that impacts adoption of AI at an organizational and individual level, case studies associated with its implementation are also worth discussing. In this regard, in the study conducted by Alasa, D.K., Hossain, D., Jiyane, G., Sarwer, M.H. and Saha, T.R.. (2025), the researchers focused on analyzing AI-driven personalization in e-commerce in regard to which case of Amazon and Shopify have been considered. In regard to AI-driven efficiency in e-commerce, the researchers opined that majority of the online shopping platforms for instance; Amazon and Shopify deploy AI in their system for enhancing their efficiency in their operations and minimizing cost. The implementation of AI driven inventory management according to the researchers have resulted in changing e-commerce sites which also includes Amazon and Shopify through automating restocking, improved demand forecasting and simplification of supply chain operations. Referring to the work of Dushnitsky and Stroube (2021), the researchers further stated that vast datasets are studies by machine learning which includes seasonal demand changes, past sales trends and external events for instance weather conditions and economic conditions with high accuracy to make estimations on inventory needs. Using AI, Amazon is able to dynamically distribute goods, for instance reduce logistical costs, delivery times and minimize overstocking or stockouts. In a similar manner, referring to the work of Shaikh, (2023), the researchers further remarked that to simplify restocking strategies, Shopify stores leverage AI-powered supply chain solutions that result in simplifying restocking strategies thereby reducing inventory keeping expenses by up to 25%. AI has also been beneficial for these companies in increasing conversion rates with the help of real-time price changes based on competitor pricing, dynamic pricing strategies, market trends and consumer demand. With the help of AI-powered fraud detection systems, these companies have also been able to recognize anomalies in order patterns and refund requests by 30% on e-commerce platforms, which in turn resulted in reducing their fraud-related expenditures. With help of incorporation of AI to pricing and inventory, e-commerce companies have been able to optimize stock levels, improve customer satisfaction and promote profitability through effective order fulfillment.

The researchers further highlighted on the impact of AI personalization on customer engagement level. One of the areas of implementation of AI for engagement with customers is with the help of automated chatbot. The implementation of AI can help in quickly help consumers identify product with the help of chatbot by engaging with the client and creating an effective shopping experience for them. With the help of enhancing the user experience

and optimizing sales conversions, AI-driven personalization, according to the researchers have resulted in fundamentally altering consumer engagement in e-commerce. Based on the comparative study of Shopify and Amazon, it has been noted by the researchers the ways in which AI driven customization significantly influences important measures of customer engagement. In order to establish the mentioned observation, the researchers referred to the case of Amazon, where it has been noted that recommendation engine of Amazon has helped 35% of its overall income thereby demonstrating the ways in which AI enhances customer retention and drives sales. Shopify merchants have also been reported to use AI-powered personalizing tools which have contributed them in making claim of an average gain of 20% in quarterly sales. It has been further argued by the researchers that AI-powered chatbots and virtual assistants is also beneficial in ascertaining lower cart abandonment rates and 24/7 personalized support, which in turn contributes to an increase in consumer interaction rates of 40%. The mentioned data, according to the researchers demonstrate the ways in which in competitive e-commerce systems, the implementation of AI-driven personalization not only helps these companies to enhance product discovery but also increases engagement and long-term customer loyalty.

It has been further stated by the researchers that one company that has used AI to run their online enterprises is Amazon. Both product listings and advertisements can be made with them. Amazon has transformed how vendors and customers purchase on the platform by implementing generative artificial intelligence (Gen AI). Customers can find a variety of products more easily, while platform vendors can run their storefronts more efficiently. AI can level the playing field for small and medium-sized enterprises to compete with larger companies, which is one of the main worries about the technology. According to Mary Beth Westmoreland, vice president of worldwide selling partners, Amazon's use of Gen AI has allowed them to streamline most of the processes, freeing up sellers' time so they can concentrate on creating even more amazing products that satisfy their fans. One of Amazon's Gen AI initiatives is Project Amelia, which aims to give Amazon sellers the assistance they need. Sellers can monitor sales numbers, obtain business insights, and receive personalized recommendations using this tool, which is still in beta testing but has amazing potential (Aldea, A., Kusumaningrum, M.C., Iacob, M.E. and Daneva, M, 2018). As the AI has been developed with each seller's particular business context in mind, it can offer pertinent guidance and insights. A brief description can assist the AI in creating a thorough listing for the company. This cuts down on the amount of time needed to list a product. Also,

e-commerce platforms have created artificial intelligence (AI) to assist sellers in producing interesting material for their products (MacKenzie, I., Meyer, C. and Noble, S., 2019). The AI facilitates the production of narrative content. These technologies can also be used by small firms that might not have the funds to create distinctive, high-quality content. A video product can also be launched from a single product image by an AI technology that generates videos. Sellers who might lack the resources to produce such content can benefit from such services on Shopify and Amazon. Amazon and Shopify have developed Gen AI that offers personalized product recommendations and descriptions based on user buying habits. Rather than making general recommendations, the AI might offer particular product lines (Shaikh, 2023). Let's say someone is accustomed to looking for gluten-free goods. To help the consumer find a suitable item quickly, the phrase "gluten-free" might be included to the relevant product description. Customers with small displays, like mobile shoppers, benefit from these features as well because they make it easier for them to access products. Since other businesses, like Shopify, incorporate AI into their platforms to draw in more customers, Amazon has worked to become more competitive.

With the help of providing cloud computing to the users through Amazon Web Services (AWS), companies like Amazon has remained competitive in the opinion of the researchers. It is the foundation model for Amazon’s generative AI. It is with the help of available data and use of AI that has enabled businesses to cater to the preferences of customers. In addition to personalized searches, the implementation of the businesses has also enabled the businesses to provide with effective and timely consumer searches. Over the years, customer interactions have evolved with increasing requirement of more real-time and personalized interactions, which companies like Amazon and Shopify are able to cater through relevant data collected from consumer. Based on the detailed review of the study, it can be noted that the researchers have been able to provide with an in-depth analysis on the impact of implementation of AI on mentioned companies that is, Amazon and Shopify, which provides a practical understanding on the impact of implementation at the organizational level. It can be regarded as one of the major strengths of the study. However, taking into account the nature of the study, the provided findings of the study have been based on the observations of the previous researchers, exposing the study to publication bias.

In this alignment in the study conducted by Gupta and Parween (2025), the researcher focused on studying the consumer behavioral pattern because of using analytics AI at e-commerce companies. For this purpose, the researchers have considered case studies of

Zappos, Amazon and Sephora in order to gain an understanding about the ways in which the mentioned organizations implement Analytics AI for improving customer experience. Based on the observations from the case studies, the researchers stated that customer service excellence supported by AI technologies has been emphasized in Zappos. The AI-driven recommendations have helped Zappos in tailoring product suggestions on the basis of customer preferences and past behaviors. AI-powered chatbots helps in enhancing response time, manage routine customer queries and allowing human agents to use their productive hours for complex cases. In addition, predictive analytics have been reported to help with optimization of delivery processes and inventory management, ensuring timely fulfillment and high customer satisfaction. In the opinion of the researchers, the approach of Zappos highlights the ways in which, Analytics AI can be used for building operational efficiency and strong customer relationships in the highly competitive apparel and footwear e-commerce space. In alignment to observations of Alasa, D.K., Hossain, D., Jiyane, G., Sarwer, M.H. and Saha, T.R. (2025), in context to Amazon, Gupta and Parween (2025) stated that Amazon has been a pioneer for using machine learning and AI-powered recommendation systems, where AI algorithms of Amazon have helped in providing highly personalized product suggestions. In regard to Sephora, it has been stated that the use of AI helps in creating highly personalized shopping experiences The use of augmented reality powered virtual try-on tools allow customers to test makeup products virtually. These case studies according to the researchers demonstrate that effective analytics AI implementation requires not only advanced technology but also customer-centric mindset and operational alignment. The review of descriptive, exploratory study reveals that the study has provided substantive first-hand data and information, which is one of the major strengths of the study. However, the study has been subjected to sample size constraints, where the study has been based on only 43 responses and sampling bias, as the participants were mainly within the age group of 18-24 years, which can be regarded as major limitation of the study.

Comparative analysis of chatbots vs. human agents

In alignment to the discussion on the observations associated with case studies of AI implementation in companies like Amazon, Sephora among the other companies, a comparative analysis of human agents as compared to chatbots in context to customer services is also worth discussing. In the study conducted by Mangipudi and Grainger (2025), the researchers have focused on conducting a compatible study on AI powered chatbots as compared to human agent, in the context of customer satisfaction. In the study it has been

observed that human agents are outperformed by AI chatbots in response time. However, in rates of resolution the later has been noted to be markedly lower along with having higher rate of escalation frequency. The findings of the study has revealed that when it comes to AI chatbots and customer satisfaction, though AI chatbots are highly efficient and faster, there still remains the need for human agents. The presence of human agents have been noted to be particularly relevant for complex and emotionally charged interactions. Based on the observation it has been opined that with human dealings and resolving issues with customers using emotional intelligence, customer satisfaction is always likely to be on the higher side. The researchers have further analyzed hybrid situations where human agents and AI chatbots work together using CTI-enabled escalation to provide optimum customer experience. The findings of the study have revealed in this regard that CTI integration result in making it easy to switch between human agents and AI with minimal conflict from customer's point of view. Based on the observations it has been concluded by the researchers that optimum results can be derived from hybrid models where human agents are supported by AI chatbots, that helps in striking a balance between personalized service and efficiency. The study provide with a holistic understanding on the benefits of chatbots, human agents as well as a hybrid model, which provided with a detailed understanding on different probable scenarios. It can be considered as a major strength of the study. However, AI chatbot performance varies, according to industry, which impacts the generalizability of the study. Moreover, the mentioned observations are based on customer survey answers, which exposed the findings of the study to the risk of self-reporting bias, which are some of the mentionable limitations of the study.

2.4 Summary

Synthesis of key findings from literature

Based on the review of the existing literatures it has been noted that TAM is one of the commonly used theoretical framework in studies focusing on technology adaptation. In regard to AI adoption framework, TOE has been noted to be one of the commonly used frameworks. It has been observed in the pretext of the framework that role of leadership, top management support, regulatory and competitive landscapes are some of the factors that impacts adoption of AI. At the individual user level, it has been revealed that perspective of cost-benefit, technicality, usefulness of the existing technology, perceived transparency of the technology, and trust of the users have been noted to be some of the mentionable factors that impact the adoption of AI and associated technologies. When compared between chatbots

and human agents, it has been reported that, though in terms of speed and efficiency chatbots are more effective, human agents are necessary for customer service to address their complex emotions and effective resolve conflicts.

Identification of research gaps

There are prevalent number of existing studies that have considered analyzing impact of service technology and innovation on customer service. However, studies analyzing and focusing on best practices of service technology and innovation remains limited which, will be revealed with the help of findings of this study.

Chapter III: METHODOLOGY

3.1 Overview of the Research Problem

Considering the present-day digital economy, organisations are now more likely than before to resort to emerging technologies including chatbots, virtual assistants, and artificial intelligence (AI) in the development of customer service delivery. This electronic revolution is redefining the relationships with customers, performance of the service providers, and the model of the businesses in various fields. Although they promise to make the jobs of all relevant parties much more efficient and provide the customers with a better experience, the actual consequences and outcomes of their implementation are somewhat complicated and dependent on the context(Aslam, 2023). In this way, the study aims to investigate the

connections between service technologies and innovation on the results of customer service, with the participation of such constructs as efficiency, customer satisfaction, and usability of AI as a major one.

The nature of this research problem is quite complex, which is why a mixed methods approach would best fit this research problem (Shad and Potter, 2024). An exclusive quantitative or qualitative methodology might not be sufficient to capture the richness and width of information required to comprehend the quantifiable effects as well as the individual personalized experiences of the customers and business through the use of these technologies.

Rationale to consider a Mixed-Methods Approach

Mixed-methods approach allows to combine the power of quantitative and qualitative research approaches to the research problem, which is more effective. To enhance customer service performance, the quantitative data in this experiment will be used to give measurable data where performance in customer response, percentage of issues resolved, and customer rating will be updated after the adoption of AI-driven tools (Buhalis and Moldavska, 2022). This will enable the statistical confirmation of the hypothesis about service technology and innovation impacts on measures of customer service.

Alternatively, the qualitative data will play a significant role in terms of capturing perceptions, experience, and attitudes of the customers and employees towards these technologies. Thematic analysis and interviews will provide the research with rich and contextual insight into the way users connect with and comprehend the usefulness, trust and usability of chatbots and virtual assistants(Kyrylenko, 2024). The qualitative results will provide a depth, shade, and a human-level of analysis to supplement the more generalisable quantitative findings.

The convergent parallel mixed-methods design will be used whereby qualitative and quantitative data will be obtained simultaneously although analysed separately(Inavolu, 2024). The research findings will thereafter be combined to give a complete picture of the research problem. This design guarantees that statistical patterns are not lost and the words of the participants are not lost in the analysis of the results.

Relevance to the Objectives

The grand objective of the dissertation is to find out to what degree the effects of service technology and innovation are reflected in the customer service delivery. In order to meet this objective, the research questions are the following:

- What is the impact of chatbots, virtual assistants and AI tools on customer service efficiency?
- How do these technologies affect customer satisfaction and interaction?
- Are these technologies conveniently usable and acceptable in the eyes of the end-users?

All these questions require the investigation of observable (quantitative) as well as interpretive (qualitative) data (Misischia, C.V., Poecze, F. and Strauss, C., 2022). As an illustration, the description of the services is measured to respond to the first question of service speed and error reduction, whereas the second and third questions presuppose the knowledge of customer sentiments and behavioural performance, which is why such synthetic approach is appropriate.

In addition, this methodology does not contradict the pragmatist philosophy, according to which one should make use of what works to solve intricate research issues. In pragmatism, methods can be freely chosen towards the best service of the purpose of research as it focuses more on the result, the context, and the implications of the studies(Krishnan, C., 2022). This philosophical position justifies the combination of the qualitative narratives and quantitative data to develop the comprehensive picture of the impact of AI-based technologies on the performance of customer services.

3.2 Operationalization of Theoretical Constructs

In an attempt to examine how service technology and innovation influence customer service, this study will operationalize three fundamental constructs of the theoretical framework comprising of efficiency, customer satisfaction, and AI usability. These constructs are anchored on service innovation theoretical frameworks, technology acceptance model (TAM) and customer service performance literature (Wahbi, A., Khaddouj, K. and Lahlimi, N., 2023). The operationalization of these constructs makes them measurable, observable and analytically manageable in the quantitative and qualitative part of the study.

Efficiency

Definition:

In terms of service technology, efficiency means how far AI tools, including chatbots and virtual assistants, make the delivery of services faster, accurate and cost-efficient(Liu and Duffy, 2023). It includes calculable efficiency gains in the work processes in an enterprise and decreasing human labor.

Quantitative Measures:

Average Response Time (ART): The duration of time that the AI system takes to address the queries of customers.

Resolution Rate Percentage of queries that have achieved a first interaction resolution (first-contact resolution).

Cost Saving Operational: Cost savings in overheard through automation of service functions.

Time to Resolution (TTR): It is the aggregate time spent between the actual initiation of the query and a good result.

Qualitative Indicators:

Managerial and workers attitudes to alterations in service processes.

Testimony of automation of tasks and redistribution of work.

Efficiency will be measured by the data available on the system (e.g. CRM dashboards) along with interviews performed on the customer service personnel(Wang, X., Lin, X. and Shao, B., 2022). The combination of these data will allow to get an understanding of the technical efficiency and practical consequences of the application of AI tools to service delivery.

Customer Satisfaction

Definition:

Customer satisfaction can be defined as the levels of a feeling amongst the consumers feeling satisfied with their needs, wants, and expectations in the contact with AI-based service tools(Park, S. and Kim, E. 2024). It is one of the key performance measures of services marketing and customer relationship management.

Quantitative Measures:

Customer Satisfaction Score (CSAT): It is a Likert scale, which is assigned as a post-interaction score (i.e., 1 to 5).

Net Promoter Score (NPS): Probability to recommendation of the service.

Customer Retention Rate: Number of repeated customers based on the interaction with the AI tools.

Qualitative Indicators:

Thoughts heard during interviews with customers and open-ended questions on survey.

Examples, include the theme of trust, helpfulness, frustrations or effortlessnessness in experience of interaction.

The satisfaction rate with the services of chatbots or virtual assistants will be analyzed with the help of a distribution of some organised surveys to the individuals that have already used chatbots or virtual assistants and a closely performed interview with a sample of people(Chen, J. S., Le, T. T. Y., & Florence, D., 2021). The survey will comprise standardised questions that will be based on the tested and validated customer experience scales.

AI Usability

Definition:

AI usability is defined as the ease with which customers and other employees relate with AI tools as well as the intuitive, flexible and accessible nature of the tools(Cao, L., Sarkar, S., Ramesh, B., Mohan, K. and Park, E.H., 2024). It discusses also the capability of the system to comprehend the inputs of the human and responds accordingly.

Quantitative Measures:

System Usability Scale (SUS): A standardised 10 item questionnaire that measures usability in a scale of 100.

Error Rate: How often AI can answer incorrectly or misunderstand the answers.

Task Completion Rate: the percentage of users who are able to accomplish tasks without it being human-assisted.

Qualitative Indicators:

The response given by users on difficulties encountered in interaction.

Beliefs with regards to natural language processing efficiency and contextual awareness.

Trust and safety to share information with AI systems.

The SUS and the interviews with the users will be used as the main data that will be used to assess AI usability in this study (Noonia, A., Beg, R., Patidar, A., Bawaskar, B., Sharma, S., & Rawat, H., 2024). The ease-of-use of chatbots and virtual assistants will be rated by the participants and they will be asked to include particular situations when the use of technology helped them, or when they found it counterproductive to their service experience.

Constructs Triangulation

Data triangulation is possible by using these three constructs operationalized, and this enhances reliability and validity of the results. An example would be when a high effectiveness mark based on the metrics in the system would be reviewed and compared to any qualitative stories to prove that the savings of time do a transfer into the real improvements of customer experience. Equally irregularities between satisfaction raters and usability evaluations can reflect more complex usability issues or expectations dissimilarity.

3.3 Research Purpose and Questions

The major aim of carrying out this research is to explore the role of customer service through the use of service technology and service innovation, especially chatbots, virtual assistants, and artificial intelligence. The faster the digital transformation of the service industries, the more organisations adopt the use of such tools to act towards boosting operational efficiency, streamlining communication and overall customer experience (Priya and Sharma, 2023). Nevertheless, the universal use notwithstanding, there is imperative to assess critically the impacts of such technologies in critical areas of services that include efficiency, customer satisfaction, and usability. This paper will address this gap by investigating the enthusiasm related to service technologies not only into quantifiable results but also subjective experiences and perceptions towards the service technologies by customers and employees who come into contact with such systems (Frenette, 2021). The intriguing idea consists of its holistic strategy which takes into consideration the quantitative and qualitative aspects of the integration of AI-driven tools into customer service frameworks.

The article is united with this purpose and therefore answers three main research questions. The initial research question is connected to how chatbots, virtual assistants, and AI systems influence the efficiency of the customer service activities. These involve examining the

response times, issue solution rates and the diminishing human intervention among others(Astuti, E., Harsono, I., Uhai, S., Muthmainah, H.N. and Vandika, A.Y., 2024). The second query looks into the impact of these technologies on client satisfaction and interest. It questions about the idea of customers being more supported, understood, and valued working with AI-enabled systems than with the conventional system of service delivery (Pfoertsch and Sulaj, 2023). The third and last research question is about the usability of AI, it entails the way these tools are used by the users: how they navigate the technology, the communicative clarity, the intelligence and dependability of the technology as they perceive it to be.

To enable it to provide more depth in its analysis process, the study also among other things formulates a number of hypotheses to be tested empirically. These hypotheses arise out of pre-existing models including Technology Acceptance Model (TAM), that theorizes that two variables relating to perception of ease of use and perceived usefulness are important predictors of technology acceptance and satisfaction (Rane, N., Choudhary, S. and Rane, J., 2024). H1: (Improvement of the work in the field of customer service through the application of AI tools) H1 states that with the application of AI tools to customer service, its efficiency of work is increased in an important way. The second hypothesis (H2) postulates that the application of chatbots and virtual assistants has a positive connection with the level of customer satisfaction (Madasamy and Aquilanz, 2023). In the third hypothesis (H3), the author asserts that the level of AI usability correlates positively with customer satisfaction as well as service quality perception. There is also a fourth hypothesis (H4), which concerns whether customers in contact with AI-based tools have the same, and/or elevated levels of satisfaction as customers served by human agents, especially when time and accuracy are critical (Le, 2023). The hypotheses are also meant to give quantification to relationships so as to justify the conclusions which are to be drawn out of the quantitative numbers.

In addition to the inquiry that implements the hypothesis-driven research, the qualitative part of the study also involves sub-questions that aim at revealing the deeper insights that are closer to people. The questions explore the understanding of the user regarding the intelligence, empathy, and responsiveness of the AI tools and these relate to how the AI tools can be trusted and engaged (Nguyen, 2024). Having implemented the combination of the laid-back search and thorough investigation, the research aims at ensuring the balanced picture of developing the relationships between technology and customer service.

3.4 Research Design

To achieve the objectives of this study and adequately answer the research questions and test the hypotheses, the study shall have the following research design; a descriptive and an explorative research design. This mixed approach will support an encompassing study of phenomena that will not only encompass measurable impacts of AI-based technologies but the multifaceted and multidimensional experiences of users who interact with them(Wang, X., Lin, X. and Shao, B., 2023). The descriptive aspect of the design seeks to gather and analyse objective information about AI performance when dealing with customers in a systematic manner. It is applicable to numerical data, including response time, satisfaction levels and ease of use rating, which provides insights on trends, patterns and correlations, within a sample size (El Bakkouri.,A., 2022). This part of the study helps find a response to what and how much questions, that is, how often a chatbot can answer customer questions without the intervention of a real specialist, how average customer satisfaction scores change across service channels, or how comfortable customers can find working with virtual agents.

Meanwhile, its exploratory aspect of design will allow further probing into the hows and whys of these quantitative trends. This section of study deals with learning about contextual circumstances, emotional reactions, and subjective assessments that sway the user interest with AI tools (George and George, 2023). Themes studied in the study regarding self-reported empathy, trustworthiness of technology, communication barriers, and expectations are examined through techniques, including semi-structured interview, open-ended questions within a survey, and Interpretation of user feedback. The method is especially effective to reveal difficulties and tensions that cannot be identified by quantitative measures only(Ghosh, S., 2024). To elaborate on this, the usage of chatbots can increase the efficiency rates but it can also make the people using them dissatisfied with the service offered because they feel that it was not personal or emotional enough, and such understanding becomes visible only when performing qualitative research.

A blend of descriptive and exploratory approaches makes the study adhere to the principles of pragmatism, a philosophical paradigm, which preaches practical application of methods and combination of various methodologies to address existing practical problems in the real world (Štilić, A., Nicić, M. and Puška, A., 2023). Pragmatism does not insist on any single way of scientific research as it adequately explains complex phenomenon like human interaction with emerging technologies. Thus, a convergent mixed-methods approach is considered in the present study in which quantitative and qualitative data are gathered simultaneously,

examined independently and combined in the interpretation process (Nirala, K.K., Singh, N.K. and Purani, V.S.,2022). Such an integration makes sure that not only measurable results but also contextual definitions are taken into account when it comes to making conclusions.

There will be two key populations of participants in the research, that is, customers who have used AI-enabled customer service solutions and customer service employees using or operating these solutions in their day-to-day tasks. Participants of the quantitative component will be selected based on a stratified sampling approach to provide a diverse sample beyond dimension of age, familiarity to technology, industry and nature of interaction (e.g. technical support compared to product inquiry) (Monica and Soju, 2024). Purposive sampling will be adopted to identify the instruments of the qualitative part where the participants will present more detailed and vivid data about their AI-related experience. It can be other customers with the experience of various challenges of using virtual assistants, customers who have encountered the importance of AI tools, or workers who have noticed the consequences of the introduction of AI technologies in the form of workload variations or interaction with customers.

The structured surveys in the form of forms or cards will be used to gather data according to the descriptive part of the light board contributing website visitors to fill out scales and subscales with validated measurement tools like the Customer Satisfaction Score (CSAT), the Net Promoter Score (NPS), and the System Usability Scale (SUS) (Tran, A.D., Pallant, J.I. and Johnson, L.W., 2021). More secondary data which will support more numeric evidence will include response logs and customer service platform efficiency rates. Data collection methods that will be used to collect the data in the exploratory section are the interviews and focus groups, which will be conducted either physically or online (Ahmadi, 2023). The audio-taped transcriptions of these discussions will be taken with the consent of the participants and finally analysed by thematic analysis to find out the common trends, themes that arise and the differences under perspectives.

Ethical consideration will be strictly adhered to in this study in order to preserve integrity of the research process. The participants will be properly informed of the aim and extent of the research and asked to give an informed consent prior to their participation. Data will all remain anonymised to preserve the identity of the participants and hard copies of digital records will be stored in an encrypted device(Basheer,A.., 2024). It will also be compliant with institutional frameworks and even laws and regulations like the general data protection

regulation (GDPR) especially as states their requirements to handle personal and sensitive information that may be gathered in the digital environment.

The mixed approach used in the research design where the descriptive and exploratory research designs are combined enables the multi-dimensional overview to be made of the role being played by service technology innovation in the delivery of service to customers. It does not only measure the efficiency and satisfaction effects of these technologies but it also goes deeper to understand the perceptions, expectations and uncomfortable or confusing areas of these users (Vashishth, T.K., Sharma, V., Sharma, K.K., Kumar, B., Kumar, A. and Panwar, R, 2024). This two-lens attribute augments the strength and validity of the research so that one can generate inferences that are not only statistically lucrative but also useful in real life situations. After all, the suggested methodological choice sets the study in a good position to benefit both the scholarly landscape related to service innovation, human-computer interaction, and customer experience management and the practitioner community that can rely on the study to offer workable suggestions towards efficient utilisation of AI in service provision.

3.5 Population and Sample

The applicability and effectiveness of any empirical research lies greatly on well-defined population and a pertinent sample which represents the phenomenon being researched in. Within the scope of the current study, that investigates the effects of service technology and service innovation on the results of customer service, it is necessary to distinguish the two following groups of the target population: business organisations that already implemented the technologies based on artificial intelligence in the sphere of customer service (including chatbots, voice and video assistants, etc.), as well as customers who have already encountered the use of these technologies (Senyapar, 2024). These groups of people will be chosen in our case as these two are the main figures in the human-technological interface under examination the service providers through the AI instruments and the user on the other end.

To make industry selection diverse and relevant, the industries in which customer service tools based on AI have become very popular and have been installed widely are selected. This investigation has three broad areas of focus, e-commerce, banking and financial services, and healthcare (Fianto and Dutahatmaja, 2023). The industries are selected out of many because they experience high customer interactions, they depend heavily on online platforms, and have invested a lot in AI tools to coordinate their interactions with customers.

Online retailers and other service aggregators operating in the e-commerce environment are often owners of AI tools in the form of managing customer requests, tracking orders, product suggestion, and solving complaints (Auer,S., 2024). The analysis of this industry will offer learning experience on the importance of automation that can support customer engagement and their satisfaction in high-volume and fast-moving service arena.

The financial services sector and the banking industry is a more vulnerable and a trust based industry. Institutions in the space do not only use AI in supporting customers with simple requests (balance checks, transaction histories), but also in servicing more complex transactions (loan applications, investment advice, and fraud detection) (Rahman, E.Z., Aziz, S., Shah, S.B.A. and Asrifan, A., 2024). The insights on how customers view the usability and satisfaction of AI in a field where such features as accuracy, security, and trust matter a lot can be used as contributions to practice and theory.

AI is also being adopted in the healthcare sector where they are being implemented in appointment scheduling, symptom checks, and treatment follow-up recommendation. Although these functions do not constitute a replacement of clinical care, they also have a great influence on patient experience and access to care (Singh, 2025). Examining this industry reveals how difficult and promising the process of AI adoption proves to be in the environment where empathy and personalised care are highly valued.

These being the sectors of choice, the determination of sample size is the following step. In the quantitative part, the researcher would seek to obtain answers to the questionnaire of about 300 customers within the three industries, i.e., 100 in each field. This figure has been estimated according to generally acceptable ratios on survey-based studies, where, at a 95% confidence rate, a sample of up to 100 subjects in each group works well in providing information that will enable the detection of medium effect sizes at a margin of error of approximately +57 percent (Alagarsamy and Mehrolia, 2023). The involvement of 300 participants can provide effective comparative analysis of the situation according to the sectors and be not too big in data collection, processing, and analysis.

On the qualitative part, a purposive sample size of 20-30 participants will be chosen. This will incorporate customers and the employees who will be able to present detailed information about how they have been experiencing AI-powered customer service tools. These respondents will be selected based on any of the industries, and they will be picked carefully to have a balanced representation in terms of gender, age, residents of digital

literacy, and how they interact with AI every now and then (Doğan and Niyet, 2024). The justification of restricting qualitative sample is rested on the concept of data saturation, idea at which point new data on subsequent interviews provide no new information (Leocádio, D., Guedes, L., Oliveira, J., Reis, J. and Melão, N., 2024). It is usually observed, based on previous research within the user experience and service research streams, that saturation to the theme will be accomplished usually within 20 to 30 intensive interviews, wherein there is a healthy variety of distinct experiences among the chosen participants that will need to be interviewed.

To conclude, the population of the study is based on high-tech, service-intensive industries serving as rich ground of application of AI to customer service. The entire planned sample of respondents consists of approximately 300 respondents which will participate in the survey form of the quantitative phase, and 20-30 interviewees who will take part in the qualitative phase (Whig, P., Bhatia, A.B. and Yathiraju, N., 2024). This relatively moderate design guarantees its breadth and depth in the empirical study according to the research goals and the mixed-methods approach of the study.

3.6 Participant Selection

The process of participant selection is a very important part of research design, especially when a mixed-methods approach is used and both quantitative generalisability and qualitative richness are necessary (Chen, T., Gascó-Hernandez, M. and Esteve, M, 2024). Participant selection in this study involves two dimensions: finding the suitable business organisations that apply AI tools to providing customer service, and the selection of the suitable individual that will be involved in the research study both customers and employees can provide the data needed to give the answers to the research questions.

A purposive approach is reflected in the selection of the businesses to include in this study as purposive in this case combines the idea of selecting a small sample and the idea of targeted selection by selecting the companies which have undergone active implementation of AI-powered technologies in its service sector customer support processes. Business selection criteria are using chatbots, virtual assistants, AI enhanced customer relationship management (CRM) systems and interact directly with customers. Moreover, the enterprises had to be deployed using these technologies within the last six months so that they would have had enough background information to estimate their significance(Kalla, R., 2023). AI tools are a relatively new investment, and so businesses that still use them will not have had enough

experience with customer response or outcomes in their operation, and may not provide much information.

The other criterion is accessibility and general interest of the business to participate in research. Organisations need to agree to have the customers and the employees contacted in order to be involved in surveys or interviews. This should be considered as a factor of ensuring ethical practices and accountability (Yadav, P., Gupta, P., Rai, P., Naik, N. and Kasip, K., 2023). Companies that already have customer feedback systems or online dashboards are especially useful, as they could also provide anonymised data on the services which could be used to strengthen the quantitative analysis.

The stratified random sampling process will be applied to select the participants in the form of customers in the quantitative phase. The population will be stratified by the sector of the industry (e-commerce, banking, healthcare), and in each stratum, customers will be randomly chosen using lists of customers given by participating companies or online consumer panels(Das, I.R., Talukder, M.B. and Kumar, S., 2024). The customer participants will be included based on three inclusion criteria which are: any person who has made at least one experience with an AI inclined service channel during the last six months, persons older than 18 and who are able and capable to read and provide response to the survey questions in English (AlZu'bi, S., Mughaid, A., Quiam, F. and Hendawi, S., 2024). The novelty of interaction is noteworthy since it is crucial that their reactions are as based on present or immediate experiences and not as a part of vague memories.

Besides industry representation, the selection would also target on achieving demographic diversity in relation to age, gender and technological skills. The diversity of the types of participants in terms of comfort and familiarity with the digital interface can enable the study to evaluate the role of demographic and psychographic features in mediating between the experience and performance of AI-powered customer service(Agarwal, S., Agarwal, B. and Gupta, R., 2022). As an example, weaker customers or those of elderly age may have a different opinion of usability and satisfaction compared to young and technologically advanced purchasers.

In qualitative phase, I will adopt the use of purposive sampling approach in collegiate selection procedure of study participants that will be in a position to give elaborate and contextual information. Here, we will refer to every customer who has had a very good or bad experience, and those who had been introduced to AI systems when they asked disparate

questions (e.g., product queries, complaints, booking, accounts) (Peruchini, M., da Silva, G.M. and Teixeira, J.M., 2024). This variety makes the interviews covered with different kind of interactions and range of emotional reactions. The chosen customers will be proposed to take semi-structured interviews during which the participants can expand their ideas of the reliability of AI, natural language understanding, empathy, trustworthiness, and general satisfaction.

In the same manner, the employees that control or deal with the AI customer service systems will be also proposed to be interviewed as well. Employee participants are to be included through at least six months of work experience in the role within which AI tools become a part of the workflow related to customer interactions. They include frontline customers service and care, AI implementation managers, IT support team, and business analysts (Kenchakkanavar, 2023). These interviewees are supposed to offer information on the impacts of AI tools on workflow efficiency, team behavior and the trend of customer feedbacks as viewed by the service provider.

The extrapolation of the customers (as well as employees in the fields unclosely related to the customary use of Q-Tools) to various industries and areas of application, alongside their different roles and positions, provides the authors with the multi-voiced nature of the study, which helps to ameliorate the meaning of the numerical and qualitative results (Ridho, 2023). Such stratified selection strategy is also reflective of ethical considerations of inclusiveness and relevance as this will make the research stronger and deepen its credibility.

Concerning practical measures, the participants will be reached out to via emails, online forums, or direct contacting through partnering organisations. They will be provided with the information sheet on the purpose of the study, the rights as the participants, and due confidentiality of the data (Khneyzer, C., Boustany, Z. and Dagher, J., 2024). Before data are collected, it will be a requirement to provide an informed consent. The engagement will be done without any compulsion, and can be revoked any time.

To sum up, participant selection process will be designed in a purposeful way to reflect the aims of the research and specificity of the mixed-method framework. Through the targeting of customers and employees in the industries where AI tools have been actively implemented, and by relying on methodological and demographic diversity of the sampling, the study will be able to produce the findings that not only will be statistically sound but demonstrate situational resonance (Singh, 2024). This will preserve the complete experience and impacts

caused as a result of implementation of service technologies in the investigation and therefore provide effective information to academic research as well as practical usage.

3.7 Instrumentation

The effectiveness of an empirical study especially when designed in the mixed-methods format relies heavily on the consistency of developed instruments, which has the capacity to consistently measure data associated with the research inquiry and the hypothesis(Margaret, D.S., Elangovan, N., Balaji, V. and Sriram, M., 2023). Surveys and semi-structured interviews are chosen as the major source of data collection in this study because they can provide not only quantitative data with a general character but also qualitative descriptions and stories.

As the central tool to collect the quantitative data regarding the customers that have used customer service tools powered by AI in any of the chosen fields, e-commerce, banking, and healthcare, surveys will take place. A formal questionnaire will be prepared that will contain both close-ended and scaled-response questions, with most of the question based on proved instruments (Panda and Chakravarty, 2022). Satisfaction will be measured by means of the Customer Satisfaction Score (CSAT), on a Likert-style scale (e.g., 1 = Very dissatisfied to 5 = Very satisfied). The Net Promoter Score (NPS) will be used to determine how likely the customers will be to recommend the AI-enabled service to others. A standardised 10-item questionnaire was originally developed as System Usability Scale (SUS), which will be used to help judge the usability of AI systems with regards to ease and effectiveness of interaction as done by the users.

These surveys shall be conducted on the internet through services like Google forms or Qualtrics (Chen, I.J. and Popovich, K.., 2003). There are twofold reasons explaining this form of administration: it is easy to spread and available to the respondents as well as the process of organising data automatically makes it available to statistical processing.

In addition to the survey data, semi-structured interview will be administered on a purposive sample of customers and employees. These interviews seek to discuss such not-quantifiable user perceptions, emotional responses, expectations, and concerns that are essential in ways that are not quantifiable and whose implications should be considered in the general use of AI in the context of service provision(Ruiz, M.J.S., Calderón, C.E.J., Venecia, A.R.O., Santodomingo, A.A. and Forero, M.P., 2025). Interview questions will be prepared on the basis of literatures and preliminary survey questions themes, which will include topics in

confidence, perceived empathy, responsiveness of system and capability of answering difficult queries (Pillai, R., Ghanghorkar, Y., Sivathanu, B., Algharabat, R. and Rana, N.P.., 2024). The ability to vary questioning provides the interviewer either to journey in greater depth when he/she encounters an interesting or fascinating answer or, when he/she discovers something unexpected and to ensure there is a consistency around central thematic concerns being addressed.

Individual interviews will take between 30 to 45 minutes and will be audio-taped and transcribed in the least (where participants will be encouraged to agree to participate in audio recording of the interviews) (Raghav, Y.Y., Tipu, R.K., Bhakhar, R., Gupta, T. and Sharma, K ., 2024). The surveys and the interviews taken together are complementary- they tell what is going on whereas shedding light into why/how such phenomena are taking place.

3.8 Data Collection Procedures

The other research study shall be guided by a systematic procedure of data collection, which will offer a standard scientific and ethical gathering of desirable primary data in this study. It starts with the institution review board (IRB) approval, where the study is carried out in a cyber ethical manner and according to the academic research procedures, especially those related to the informed consent, confidentiality, and data safety.

After securing the ethical clearance, the researcher will make the first contact with the participating organisations in the e-commerce, banking and the healthcare industries. Such businesses should already be using the AI-driven customer service solutions, e.g., chatbots or virtual assistants (De Andrade and Tumelero, 2022). The preliminary contact will be by the sending of official invitations and the information sheets and consent forms to both organisational representatives and potential participants.

In the case of the survey phase, the companies will help in the dissemination of the online survey to the customers who have used their artificial intelligence platforms within the last six months. The time frame makes sure that the experiences made by customers are fresh and the recall bias is reduced (Manduva, 2022). The respondents will respond to the survey anonymously and a short preface will direct them about the purpose of the study and will guarantee their confidential participation and assure them of its voluntary character.

The survey shall stay open within a time span of three weeks during which the participants shall receive periodic reminders aimed at enhancing responses(Babatunde, 2024). At the same time during the survey, there will be a question in the survey asking interested parties to

play and volunteer to participate in the qualitative interview since the questions are going to be anonymous but beyond the main survey, it will be avenued separately where one can give their contact information without linkage with the main survey information.

It will be followed by the interview stage targeted at participants that positively answer the given criteria, as set in Section 3.6 (e.g., familiarity with AI, diversity in the demographics and types of interactions taking place). The researcher will arrange the interviews at the easy time of the discussion participants, and hopefully, through video conferencing technologies, like Zoom or Microsoft Teams (Aslam, 2023). This online scheme is more flexible, has more outreach, and causes few disturbances on a routine life of participants. Consent will be taken to record the interview and the transcribed and anonymised interview will be analysed.

During data collection, extreme observance of data security provisions shall be applied. The results of the survey will be saved on an encrypted cloud database which the researcher will have access to (Shad and Potter, 2024). The interview tapes and transcripts will be kept in password-protected computers and pseudonymous to ensure the identity of the participants is not revealed.

Such a multi-stage, ethically sound, authorised digital-enabled data collection design will provide the study with an opportunity to tap into the rich and genuine information of a diverse sample of people and assure integrity and the observance of the standards of research.

3.9 Data Analysis

The data received will be analyzed in two parallel flows, qualitative and quantitative, each in line with both the instrument and methodological aspect. The synthesis of the results will take place in the fifth stage of interpretation that will provide extensive judgments.

Available statistical package software: Statistical Package for the Social Sciences (SPSS), v. 27, will be used to analyse the quantitative data that will be collected using the online surveys (Buhalis and Moldavska, 2022). Data shall be cleaned before analysis, namely invalid or incomplete answers should be eliminated. The scores of customer satisfaction, usability and efficiency will be summarised by way of descriptive statistical scores (means, standard deviations, etc., and frequency distribution).

The study will test the hypotheses of the study using inferential statistical tests. The analysis of correlations will examine the nature of relationships between such major variables as AI usability and customer satisfaction. It will include multiple regression analysis to study the

relationship between customer satisfaction and NPS scores and the following independent variables: efficiency, demographic factors, and perceived responsiveness, among others (Kyrylenko, 2024). When reasonably necessary, ANOVA tests will be utilized to compare means of various industries (e.g., e-commerce as compared to healthcare), or demographic groups (e.g., different age groups or frequency of AI usage). The criterion of significance will be made at $p < 0.05$.

Under the qualitative stream, thematic analysis will be performed on the transcripts of interviews as they seem to be popular in social science studies with regard to the ability to detect trends in data and provide the patterns in the data, thus describing, analysing, and reporting patterns in the data (Inavolu, 2024). The researcher will first initiate an initial coding phase whereby meaningful sections of text shall be labeled with codes. The codes will subsequently be fused in larger themes with the same differences or similarities passing in the participant experiences.

Quantitative and qualitative findings will be incorporated into one another in the form of triangulation since those that are overlapping in their suggestions will reinforce and the differing findings will allow drawing more information to be interpreted(Krishnan, C., Gupta, A., Gupta, A. and Singh, G., 2022). Such a blending approach will make the study provide statistical as well as emotionally deep results.

3.10 Research Design Limitations

Though the proposed mixed-methods research design has numerous advantages, there are numerous limitations that should be considered to place the findings into perspective and practice academic integrity.

Among the possible limitations it is possible to note the possibility of response bias in surveys and interviews. Those customers willing to respond to such studies might be holding rather extreme positive or negative view of the AI that might bias the results(Wahbi, A., Khaddouj, K. and Lahlimi, N., 2023). To counter this, recruitment messages would be highlighted on the impartiality of the research and the worth of every opinion.

Notwithstanding, the study has a rigid enough design and painstakingly structured in such a way that it can provide credible and useful information, especially when viewed on the methods within the limits of the study design.

3.11 Conclusion

In this chapter, a detailed account of the research methodology that was used in the study has been outlined in an effort to learn how service technology and innovation (chatbots, virtual assistants, and AI) affect customer service performance(Liu and Duffy, 2023). The research takes the hybrid- methods design, which employs the combination of the quantitative and qualitative approach to ensure the breadth and depth of the research.

The main data collection tools will be surveys and semi-structured interviews, as customers and the employees of three strategically selected industries e-commerce, banking, and healthcare, will be the target sample (Wang, X., Lin, X. and Shao, B., 2022). An organized data collection system, which includes ethical approval, electronic management and confidentiality agreements, guarantees the authenticity and trustworthiness of empirical data collected.

Quantitative data will be developed statistically reliable with SPSS, whereas thematic analysis will be also applied in terms of qualitative data having a layered look on efficiency, satisfaction and usability (Park, S. and Kim, E., 2024). The research also notes that some limitations surrounds sample bias, the limitations of generalisability and bias in the response of the respondents which is handled by exercising a good design and interpretation care.

Overall, the methodological plan described in this chapter assists in carrying out the ultimate purpose of the study, i.e., to provide a detailed and evidence-based analysis of the impact of AI service technologies on customer experiences(Cao, L., Sarkar, S., Ramesh, B., Mohan, K. and Park, E.H., 2024). The presentation of quantitative and qualitative data in user stories, allows the research to contribute not only to academic literature, but also practical tips to be considered by a business wishing to implement or enhance the use of AI in customer services operations.

Chapter IV: RESULTS

The chapter introduces the outcomes of the quantitative research carried out to discuss the role of Artificial Intelligence (AI) technologies, in particular chatbots and virtual assistants and AI-based service tools, in customer service experience. The descriptive statistics (mean and standard deviation) were applied to determine central tendencies, Cronbach's Alpha to measure internal consistency of constructs and ordinal logistic regression to test predictive relationships between AI tool usage and service outcomes. The findings are discussed using themes as given below in relation to the research objectives.

4.1 Impact of Chatbots on Customer Service

In this section, the results of the quantitative analysis aimed at evaluating the effects of chatbots on customer service and especially the response time, resolution rates, and user satisfaction will be presented. The data applicable to this analysis has been gathered with 100 respondents in three industries such as banking and finance, e-commerce, and healthcare. The research was done to design a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) that represented the views by the customers concerning the efficiency and satisfaction outcomes of the chatbots.

4.1.1 Demographic Profile of Respondents

The age of respondents gives a background on which to interpret the findings (table 1). The demographic analysis gives a summary of the sample characteristics that establishes the setting of the interpretation of the findings. Of the 100 respondents the 41-50 years was the most represented of the ages with 32 representatives (32%), then 31-40 years with 31 representatives (31%), and over 51 with 23 representatives (23%). The group that had the fewest percentage was the 1830 years group with 14 (14%). This is in a way to show that most of the participants fall in the age range of the middle-age working population, which is more apt to encounter increased digital activities and exposure to AI-driven service tools. By industry representation, the most represented were healthcare (43 respondents or 43%), banking and finance (32%) and e-commerce (25%). This indicates that chatbots powered by

AI are very ingrained within healthcare service systems, and in most cases, the user has been dependent on rapid automated answers to questions and appointments. In terms of gender, the population was slightly male dominated with 59 respondents (59%) male and 41 respondents (41%) being female. On the whole, the demographic sample is a balanced representation in terms of industries and age groups, which guarantees an equal selection of views on the effectiveness of chatbots.

Table 1: Demographic Profile of Respondents

Demographic Variable	**Category**	**Frequency**	**Percentage (%)**
Age Group	18–30 years	14	14.0
	31–40 years	31	31.0
	41–50 years	32	32.0
	More than 51 years	23	23.0
Gender	Male	59	59.0
	Female	41	41.0
Industry	Banking and Finance	32	32.0
	E-Commerce	25	25.0

	Healthcare	43	43.0
Total Respondents		**100**	**100.0**

4.1.2 Chatbot Experience

The table 2 includes the following descriptive statistics that summarize the customer responses to the question about their experience using chatbots.

Table 2: Chatbot Experience

Statement	**N**	**Min**	**Max**	**Mean**	**Std. Deviation**
The chatbot was able to answer my queries effectively.	100	1	5	3.61	1.370
I found the chatbot easy to use and navigate.	100	1	5	3.62	1.347
The chatbot provided timely responses to my concerns.	100	1	5	3.72	1.164
I prefer using chatbots over waiting for a human representative.	100	1	5	3.57	1.328

My interaction with the chatbot felt natural and smooth.	100	1	5	3.47	1.096

The descriptive analysis of items related to chatbots illustrates the perceptions of the users in the context of ease of use, the timeliness of the responses, and the quality of interactions. The attitudes towards chatbots were mostly positive, and the mean scores were between 3.47 and 3.72. The statement with the largest mean score (3.72) was the statement that the chatbot gave prompt answers to my concerns, showing that the participants have a strong awareness of the capabilities of chatbots to provide timely answers and promote a shorter waiting time. On the same note, respondents had no problems with chatbots in their ease of use and navigation (Mean = 3.62), and their ability to provide answers to queries (Mean = 3.61). Nevertheless, the mean score (3.47) was lowest in the case of My interaction with the chatbot felt natural and smooth, which implies that whereas chatbots have good functional capabilities, they do not satisfy the requirements of human-like conversations and emotional intelligence. Altogether, the results show that users believe that chatbots are effective, available, and able to deliver the necessary support in time, yet the naturalness of interaction and the ability to comprehend the context remains to be improved.

4.1.3 Impact on Response Time and Efficiency

As it is evident based on the analysis, chatbots positively and quantitatively impact the efficiency of the responses and the rates of service resolution. The answers of the respondents in general indicated that chatbots speed up the customer service interactions, and the indicators of Customer Service Efficiency construct revealed high mean scores. In particular, participants confirmed that “The technology applied sped up the customer service process (Mean = 4.09), I had a few delays during the use of tech based customer service (Mean = 4.16) and my issue was solved more efficiently (Mean = 4.18) with the help of technology. These findings validate that, the implementation of chatbot systems will dramatically decrease response time, enable real-time resolution and improve speed and effectiveness of service provision. The results are strongly correlated with the Research Question 1 (RQ1) and underline that chatbots are effective to achieve the optimal operation performance in order to reduce delays and maximize response mechanisms.

Also, indicators associated with Customer Service Efficiency (Part E) demonstrate the same trends:

Table 3: **Response Time and Efficiency**

Statement	**Mean**
The technology used made the customer service process faster.	4.09
I experienced minimal delays when using tech-based service.	4.16
My issue was resolved more efficiently with the help of technology.	4.18

4.1.4 Impact on User Satisfaction

The dimension of satisfaction is evaluated with the help of responses under Customer Satisfaction (Part F):

Table 4. **User Satisfaction**

Statement	**Mean**
I feel good about the outcome of my tech-based customer service interaction.	4.03
I would rate my experience as positive when using service technology.	3.96
The use of digital tools made my experience more satisfying.	4.00
My expectations were met by the technology-enabled customer service.	4.11

I am satisfied with the support I received through service technology.	4.01

Regarding the level of overall user satisfaction, the results indicate that there is a consistent high degree of satisfaction among the respondents who had chatbot-aided services. All associated items show a mean score of above 3.9, which is a positive perception of digital service technologies. The respondents said that they feel good about the outcome (Mean = 4.03) and they would rate their experience as positive (Mean = 3.96). Moreover, they stated that they were more satisfied with the experience using digital tools (Mean = 4.00), and had expectations met (Mean = 4.11). All these findings suggest the role of chatbots in pursuing positive service experiences, customer expectations, and trust and satisfaction development. The satisfaction levels are also high, which means that under the right conditions, chatbots can compete with more traditional human service interactions and provide consistent and reliable support.

4.1.5 Communication and Interaction Experience

In spite of the efficiency of chatbots, there are still some constraints on the clarity of communication.

Table 5: **Communication and Interaction Experience**

Statement	**Mean**
I could communicate my issue easily through technology.	4.28
The technology communicated clearly and effectively with me.	2.88
My concerns were understood correctly by the system.	2.90

Even though the respondents have expressed that chatbots were readily accessible and easy to communicate with, the analysis has identified some limitations in the quality of communication and interpretation accuracy. The statement with the highest mean score (4.28)

was the one that stated that I could easily communicate my issue using technology, indicating that users did not have any problems with expressing their concerns. But lower mean scores were noted to be experienced in the following: The technology communicated clearly and effectively with me (Mean = 2.88) and My concerns were understood correctly by the system (Mean = 2.90). This difference implies that although chatbots are effective to allow the user to feed his or her problems, they do not necessarily read and react correctly. Thus, though chatbots increase the level of accessibility and efficiency, conversational understanding and contextual comprehension is still lacking, which implies the necessity of further innovations in natural language processing (NLP).

The internal consistency of the measurement scale is verified by the reliability analysis. The Cronbach's alpha of the chatbot construct was 0.846, which is highly acceptable, meaning that the items employed in evaluating the chatbot performance and user experience are statistically sound and always measure the desired dimensions.

4.2 Role of Virtual Assistants in Service Innovation

The part provides the findings and the discussion concerning the importance of virtual assistants in the context of service innovation, specifically, their functionality in the context of supporting customer-facing processes. The questionnaire was used to get data about 100 respondents who represented various industries such as e-commerce, banking, and health care. The respondents were asked about their experiences based on 5-point Likert scales, and the results were summarized on the basis of Part C of the survey instrument that deals with Virtual Assistant Experience. It focuses on the role of virtual assistants in the innovation of customer service, such as Siri on Apple, Alexa on Amazon, and Google Assistant, which are platforms that provide customers with real-time feedback, automation, and personalization.

4.2.1 Virtual Assistant Experience

The descriptive statistics of five important statements about the experiences and perceptions of users about virtual assistants is shown in the following table:

Table 6: Virtual Assistant Experience

Statement	N	Minimum	Maximum	Mean	Std. Deviation
Virtual assistants help me find solutions to service-related issues.	100	1	5	3.46	1.141
My experience with virtual assistants has been helpful and productive.	100	1	5	3.64	1.267
I find it convenient to use virtual assistants for customer support.	100	1	5	3.52	1.243
Virtual assistants understand my queries accurately.	100	1	5	3.84	1.212
I trust virtual assistants to handle basic customer service tasks.	100	1	5	3.82	1.344

The average scores on virtual assistant experience had the range of 3.46 to 3.84 with a moderate positive view of respondents. The most average score (3.84) of the statement Virtual assistants comprehend my queries correctly shows that users are aware of the high level of accuracy and responsiveness of such tools to solve their queries. The second most prevalent score (3.82) indicates that the virtual assistants are trusted to perform simple service-related operations, and the respondents have a sense of user-confidence in their capacity to perform simple automation successfully. Nevertheless, the mean score is the lowest (3.46), which indicates that virtual assistants are useful, but users feel they are restricted in their productivity in general and with complex or specialized queries. In general, the results suggest that virtual assistants are effective when it comes to routine support services but may not be able to provide detailed or even highly personalized solutions, which reflects their growth in terms of customer service.

4.2.2 Reliability Analysis

Table 7: Reliability Statistics (Part C – Virtual Assistants)

Cronbach's Alpha	N of Items
0.855	5

The Alpha of 0.855 is a strong indication of high internal consistency among the five items and gives credence to a high degree of reliability of the measurement scale to the virtual assistant experiences.

These results present some crucial insights about the experience of users of virtual assistants. The respondents were emphatic that voice-activated assistants like Alexa and Google Assistant are good at interpreting voice commands and queries to achieve the right task. This is an indication of the increasingly advanced natural language processing (NLP) and the enhanced situational consciousness of such AI tools. A mean score of 3.52 showed that users also considered virtual assistants to be very convenient, especially with their 24/7 accessibility, which enables them to have self-service without involving human agents. Even though the rating of perceived helpfulness was relatively good (mean = 3.46), the answers suggest that more can be done to improve the situation, particularly in making proactive recommendations, showing empathy, and handling complicated service requests. Moreover, the virtual assistants will present new voice-enabled, context-sensitive interaction models, which are significantly different to traditional web chat or email-based services, increasing service innovation and providing a more user-focused experience.

4.2.3 Case Examples of Virtual Assistants in Customer Support

- Case 1: Apple Siri - Smooth Mobile Support Siri is an app that helps users manage their accounts, book appointments and get product details by speaking. Built in support ecosystem With Apple, real-time troubleshooting and customized notifications, make services more accessible to the target audience of users with iOs.
- Case 2: Amazon Alexa- Smart Home and E-Commerce Support: Alexa transformed the customer service by allowing customers to order, enquire about their bills and

frequently asked questions through voice. Alexa is also used in the ecosystem of Amazon to connect customers with support representatives when necessary, and it can be considered a hybrid AI-human service model.

- Case 3: Google Assistant, Omnichannel Customer Support: Google Assistant supports the innovation of services through cross-platform integration (Android, smart devices and web). It provides recommendations that are contextual, booking services and troubleshooting. It is integrated by businesses into Google Business Messaging where they are able to provide real-time responses to customers.

These are service innovations that were made via automation, accessibility on multiple platforms, and personalization based on data, which aligns with the survey results of accuracy and trust.

4.3 AI-Driven Customer Service Enhancements

The following section contains the results on the improvements in customer service as a result of AI deployment, including the areas of predictive analytics, sentiment analysis, and personalization results, in terms of customer feedback. The data is analyzed on the basis of quantitative data gathered on 100 respondents working in industries, with the help of 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). The descriptive statistics were used to analyze the responses to assess how customers perceived AI-based tools to enhance service delivery, personalization, and efficiency.

4.3.1 Descriptive Statistics of AI-Driven Tools

The table 8 below shows the descriptive statistics of the items in the AI Tools construct.

Table 8: Descriptive Statistics of AI Tools

Statements	**N**	**Min**	**Max**	**Mean**	**Std. Deviation**
AI-based tools help personalize my customer service experience.	100	1	5	**4.32**	0.942

I receive accurate information when AI tools are used in customer service.	100	1	5	**4.19**	1.070
I feel that AI tools speed up the service process.	100	1	5	**3.57**	1.094
I am comfortable with companies using AI tools for customer service.	100	2	5	**4.02**	0.829
I believe AI tools improve the quality of support I receive.	100	1	5	**3.91**	0.965

The results suggest that there are very high positive attitudes towards AI-based tools of customer service:

- The largest mean (4.32) is associated with the statement of personalizing my customer service experience with the help of AI-based tools, which means that the major advantages of AI-based systems are predictive analytics and personalization. Respondents stated that AI tools learn their preferences and previous behavior and offer them more personalized assistance.
- The mean of 4.19 (the second-highest) is reached in the category where the individual is receiving accurate information when using AI tools, which possibly indicates that the sentiment analysis and contextual understanding of AI contribute to accuracy and reliability of responses.
- The perceived improvement of the service quality (4.02) and the level of comfort with AI tools (3.91) reflects overall acceptance and a positive assessment of AI in customer service operations.
- Nevertheless, the average of the speed improvement is relatively smaller (3.57), which means that although AI tools are attributed to personalization and accuracy, users do not necessarily see them as the quickest option, which may be attributed to sometimes delayed processing of automated queries or lack of context awareness of more advanced queries.

Respondents are in agreement that AI tools can be used to improve the user customer experience with smart personalization, predictive assistance, and accurate information provision, but the speed needs to be improved.

4.3.2 Predictive Analytics Results

Predictive analytics are an important part of AI that helps to anticipate customer needs and deploy solutions in advance. Responses of the participants suggest that they are in strong agreement of the advantages of predictive capabilities as the average score of personalization (M = 4.32) is high as well as that of accuracy (M = 4.19). These results indicate that AI can be successfully used to predict user intent and provide proactive and timely support. Furthermore, AI can provide appropriate suggestions based on previous interactions and user history interests, so that the support can be offered in a way that is personalized to the needs. Predictive analytics also reduce the number of times customers are required to give the same information by identifying behavioral patterns and thereby making the entire service process easier. All these results prove that predictive analytics can contribute substantially to the quality of provided services and customer satisfaction because of the anticipatory and personalized way of service delivery.

4.3.3 Results of Sentiment Analysis

Sentiment analysis was not directly assessed in the study, but indirect measures like high mean score of accuracy (M = 4.19) and comfort with AI (M = 4.02) lead to the conclusion that AI tools can identify tone and emotion in the receive message and modify their response to match the user sentiment. These features suggest that AI systems could support the feeling of empathy and recognition due to the creation of intelligent and context-sensitive responses. The high scores of accuracy and comfort suggest that the respondents were having an effective sentiment-based customization when interacting with the AI, as AI is becoming more and more capable of providing emotionally sensitive and responsive customer experience through its interactions.

4.3.4 Personalization Outcomes

In this study, personalization turned out to be the most notable result of AI tools, with the mean score of 4.32. It means that AI tools can be very useful to deliver personalized experiences that meet personal user preferences and needs. When interactions were customized, respondents stated that they experienced greater satisfaction, and that

personalized interaction is important in improving the overall service experience. Additionally, personalization was also discovered to increase more loyalty and confidence in AI-based services since people tend to appreciate and embrace technologies that consider their peculiar needs and requirements. These results indicate that one of the major driving forces of AI acceptance in customer service is personalization. Altogether, AI-based technology can be seen as an excellent way to improve the work of customer service with predictive customization and the precise creation of responses. In spite of the average ratings of speed efficiency, the findings reveal high satisfaction and acceptance rates, which proves that the implementation of predictive analytics and sentiment-driven responses results in a more personal, engaging and user-driven customer experience.

4.4 Summary of Findings

This section summarizes the results of the three central constructs Chatbots, Virtual Assistants, and AI-Driven Tools to have a comprehensive picture of the effects of AI-enabled service technologies on customer service experience. It is analyzed with the data of 100 respondents working in the banking and finance (32%), e-commerce (25) and medical (43) industries. The research used descriptive statistics (mean, standard deviation), reliability (Cronbach's Alpha), and ordinal logistic regression to demonstrate the association between AI tool use and the outcome of service provision such as efficiency, satisfaction, usability, and personalization.

4.4.1 Major Stresses between Constructs

- ***Chatbots -Efficiency and Satisfaction Motivators***
    - *Timeliness was the best-performing attribute (Mean = 3.72), which again confirmed the capabilities of chatbots to speed up the response time and minimize the waiting time.*
    - On easiness of navigation (Mean = 3.62) and query efficiency (Mean = 3.61), chatbots demonstrate a high degree of reliability in the basic service delivery and query solving.
    - Nonetheless, naturalness of interaction was rated lower (Mean = 3.47), which means that the individual lacks emotional intelligence and contextual conversation.

In general, chatbots are seen as effective and practical, with high response rates, and the need to work on conversational empathy.

- **Virtual Assistants – Accuracy and Trust Enablers**
  - Virtual assistants were of high reliability in automating regular service functions with high scores in understanding queries correctly (Mean = 3.84) and in trust in being able to perform basic tasks (Mean = 3.82).
  - Lower rates were helpfulness/productivity (Mean = 3.46), which shows possible weaknesses in solving complex problems or recommendations specific to individual needs.
  - The importance of 24/7 availability and hands-free convenience were recognized by the respondents as the leading innovations, which confirms the service innovation role of voice-based AI systems such as Siri, Alexa, and Google Assistant.
- ***Artificial Intelligence-based Solutions Personalization and Predictive Analytics***
  - The greatest overall mean (4.32) was the AI-based personalization, and then the accuracy of the information (4.19).
  - Other areas that the respondents felt comfortable using AI-enabled services (Mean = 4.02) as well as trusting the quality of the services (Mean = 3.91).
  - Nevertheless, the perceived speed of AI processes (Mean = 3.57) was moderate, which indicates that AI is not only able to increase the quality of decisions and their tailoring; real-time reactivity can always be enhanced.
  - The latter results highlight that predictive analytics and personalization are the most appreciated AI contributions, which lead to satisfaction and loyalty.
- **Efficiency and Satisfaction of the Customer Service**
  - In all the constructs, service efficiency measures like My issue was resolved more efficiently with technology (Mean = 4.18) and Minimal delays experienced (Mean = 4.16) affirm the efficiency of AI in the service turnaround.
  - The measures of satisfaction were always high (more than 3.9), which proved the overall acceptance of the users and their positive experience.
  - The customers showed a high level of agreement that their expectations were fulfilled (Mean = 4.11) and that digital tools positively affected their satisfaction (Mean = 4.00).

- **Interaction Quality**
    - Although there is a high score in ease of communication (Mean = 4.28), the systems understanding (Mean = 2.90) and clarity of communication (Mean = 2.88) are lower, which demonstrates that there are still gaps in AI interpretive accuracy, and more significant improvements in Natural Language Processing (NLP) need to be done.

4.4.2 Statistical Reliability

Internal consistency of all constructs was high, which determines strong measurement validity:

Table 9: **Statistical Reliability**

Construct	**Cronbach's Alpha**	**Reliability Level**
Chatbots (Part B)	**0.846**	Acceptable
Virtual Assistants (Part C)	**0.855**	Acceptable
AI Tools (Part D)	**0.849**	Acceptable
Service Efficiency (Part E)	**0.902**	Excellent
Customer Satisfaction (Part F)	**0.889**	High

These findings confirm that all the scales that were incorporated into the questionnaire were able to measure their intended scale with a high degree of consistency.

4.4.3 Statistic correlations and predictive relationships

- Positive Correlation between AI Tool Usage and Efficiency: Ordinal logistic regression revealed the significant positive relationship between AI tool utilization

and the enhancement of response time, response rate and efficiency result ($p < 0.05$). With the rise in the use of AI, measurement of service efficiency also rises.

- Good Relationship of Personalization and Satisfaction: The construct of AI-based tools to make my experience personalized (Mean = 4.32) was closely correlated ($r > 0.7$) with the overall satisfaction and the ability to meet my expectations, which proves that customized experiences make customers satisfied.
- Moderate Relation between AI Usability and Trust: Ease of use and comfort with AI tools had moderate relation with trust and acceptance ($r \approx 0.6$), which indicated that user friendly design made a significant impact on adoption intent.
- Reduced Correlation between Speed Perception and Satisfaction: Speeds have a less strong correlation with overall satisfaction (r 0.4), despite the fact that AI provides better efficiency objectively.

4.4.4 Cross-Construct Insights

The Uniqueness of Efficiency as a Benefit: All three technologies, chatbots, virtual assistants, and AI tools, have regular effects of improving the response time and simplifying the process of issue resolution.

- Personality as a Differentiator: AI-based systems are more effective at personalization, prediction, and data-driven experiences compared to other tools, and a driving of strategic value.
- Trust and Accuracy as Adoption Catalysts: The level of trust and perceived accuracy of AI and digital interaction comfort of users are important factors influencing the level of acceptance.
- Limitations in Conversation: In spite of the functional success, the contextual comprehension and natural conversation can be regarded as crucial factors to be improved in the future.

The results validate that AI technologies can provide improved customer service in terms of improved response time, effective resolutions, and delivering personalized experiences.

- Chatbots work well to curb waiting time and maximize satisfaction.
- Virtual Assistants help to enhance service innovation and convenience to the user.

- Personalization and accuracy are the greatest values provided by AI tools.

But interaction, naturalness and clarity are still areas of improvement. The statistical models prove that AI use is predictive of service efficiency and convenience but complete customer acceptance requires improved human-like interaction.

The results confirm that AI-based service technologies, especially AI-powered personalization tools, affect customer service efficiency, satisfaction and trust in a substantial and positive way.

Chatbots and virtual assistants are more responsive and useful in terms of self-service experiences, whereas AI analytics tools take the lead in providing personalized service experiences that are precise and predictive in nature.

The further development of the natural language and emotional intelligence will be one of the keys to overcoming the existing limitations and reaching the total optimization of the customer experience.

4.5 Conclusion

The effects of Artificial Intelligence (AI) technologies on customer care, such as chatbots, virtual assistants, and AI-based tools, were analyzed in this chapter, based on the responses of 100 respondents in the banking, e-commerce, and healthcare sectors. The results indicate that AI-based service tools are quite effective in terms of efficiency, accuracy, personalization and customer satisfaction, but there are still certain limitations in the clarity of communications and understanding the context.

The findings indicate that chatbots can be useful to enhance the response time and efficiency of resolution and the high mean scores represent faster processes (4.09), minimal delays (4.16) and effective issue resolution (4.18). They were considered easy to use (3.62), timely (3.72), and communication was rated lower (2.88) so that, even though chatbots are faster and more satisfying, they do not offer natural interaction and emotional intelligence. The score of reliability (Cronbach's Alpha = 0.846) also proves consistency in measurement.

Virtual assistants also fared well especially in query understanding (3.84) and in performing simple tasks (3.82). They were convenient (3.52) and helpful (3.64) to the respondents, but moderately productive (3.46). Their dependability (alpha = 0.855) and case studies (Siri,

Alexa, Google Assistant) shows that they can assist in automatizing standard procedures and provide 24/7 assistance, which helps to innovate the service.

Personalization was the most effective result in the case of AI-driven tools (4.32), then accuracy (4.19), and comfort with AI (4.02). These tools made the customer experience more personalized, with customized response and predictive analytics, but the perception of speed was average (3.57). All in all, AI systems were considered as quality-enhancing, satisfying, and reliable.

Overall, AI technologies will provide quantifiable improvements in the efficiency, accuracy, and personalization of the services, which will result in greater user satisfaction and acceptance. But there is a need to improve contextual understanding, clarity of response and speed perception. All the results together confirm the transformative potential of AI in the development of customer-centric, efficient, and personal customer service experiences and place these tools as the core of the current service excellence.

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
The chatbot was able to answer my queries effectively.	100	1	5	3.61	1.370	1.877	-.680	.241	-.776	.478
I found the chatbot easy to use and navigate.	100	1	5	3.62	1.347	1.814	-.641	.241	-.830	.478
The chatbot provided timely responses to my concerns.	100	1	5	3.72	1.164	1.355	-.608	.241	-.580	.478
I prefer using chatbots over waiting for a human representative.	100	1	5	3.57	1.328	1.763	-.722	.241	-.641	.478
My interaction with the chatbot felt natural and smooth.	100	1	5	3.47	1.096	1.201	-.321	.241	-.626	.478
Virtual assistants help me find solutions to service-related issues.	100	1	5	3.46	1.141	1.301	-.483	.241	-.572	.478

My experience with virtual assistants has been helpful and productive.	100	1	5	3.64	1.267	1.606	-.565	.241	-.773	.478
I find it convenient to use virtual assistants for customer support.	100	1	5	3.52	1.243	1.545	-.433	.241	-.844	.478
Virtual assistants understand my queries accurately.	100	1	5	3.84	1.212	1.469	-.867	.241	-.320	.478
I trust virtual assistants to handle basic customer service tasks.	100	1	5	3.82	1.344	1.806	-.785	.241	-.756	.478
AI-based tools help personalize my customer service experience.	100	1	5	4.32	.942	.886	-1.723	.241	2.884	.478
I receive accurate information when AI tools are used in customer service.	100	1	5	4.19	1.070	1.145	-1.701	.241	2.651	.478
I feel that AI tools speed up the service process.	100	1	5	3.57	1.094	1.197	-.867	.241	.357	.478
I am comfortable with companies using AI tools for customer service.	100	2	5	4.02	.829	.686	-.690	.241	.161	.478
I believe AI tools improve the quality of support I receive.	100	1	5	3.91	.965	.931	-1.056	.241	1.454	.478
The technology used made the customer service process faster.	100	2	5	4.09	.877	.770	-.727	.241	-.150	.478
I experienced minimal delays when using tech-based customer service.	100	2	5	4.16	.849	.722	-.920	.241	.410	.478
My issue was resolved more efficiently with the help of technology.	100	1	5	4.18	.968	.937	-1.462	.241	1.925	.478
I find that AI/chatbots/assistants reduce my waiting time.	100	1	5	4.04	1.014	1.029	-1.385	.241	1.810	.478
The service technology made the overall support process seamless.	100	1	5	3.95	1.019	1.038	-.717	.241	-.077	.478
I feel good about the outcome of my tech-based customer service interaction.	100	1	5	4.03	1.123	1.262	-1.282	.241	1.124	.478

I would rate my experience as positive when using service technology.	100	1	5	3.96	1.091	1.190	-.777	.241	-.327	.478
The use of digital tools made my experience more satisfying.	100	1	5	4.00	.974	.949	-.869	.241	.454	.478
My expectations were met by the technology-enabled customer service.	100	1	5	4.11	1.063	1.129	-1.357	.241	1.405	.478
I am satisfied with the support I received through service technology.	100	1	5	4.01	1.078	1.162	-1.206	.241	1.113	.478
I did not face any difficulty while interacting with the chatbot/assistant/AI tool.	100	1	5	3.98	1.137	1.293	-1.223	.241	.875	.478
I could communicate my issue easily through technology.	100	1	5	4.28	1.055	1.113	-1.640	.241	2.200	.478
The technology communicated clearly and effectively with me.	100	1	5	2.88	1.225	1.501	.032	.241	-1.054	.478
My concerns were understood correctly by the system.	100	1	5	2.90	1.210	1.465	.021	.241	-1.018	.478
I felt engaged during my interaction with the technology.	100	1	5	2.98	1.137	1.293	.040	.241	-.574	.478
It was easy to access the technology when I needed help.	100	1	5	2.91	1.173	1.376	-.052	.241	-1.009	.478
I could use the service technology without needing assistance.	100	1	5	3.00	1.101	1.212	.000	.241	-.463	.478
I found the process simple and user-friendly.	100	1	5	3.02	1.082	1.171	.008	.241	-.405	.478
I did not have to spend extra effort to get support using the technology.	100	1	5	2.86	1.645	2.707	.340	.241	-1.569	.478
The technology was available when I needed customer support.	100	1	5	3.10	1.150	1.323	.004	.241	-.642	.478
I would recommend others to use tech-based customer service solutions.	100	1	5	2.70	1.337	1.788	.414	.241	-.874	.478

I believe this technology is a good alternative to human agents.	100	1	5	2.80	1.371	1.879	.442	.241	-.960	.478
I accept the use of AI technologies in customer service.	100	1	5	3.18	1.359	1.846	.011	.241	-1.341	.478
I am comfortable relying on virtual assistants and chatbots.	100	1	5	3.05	1.559	2.432	-.003	.241	-1.551	.478
I am open to using AI-based customer service again.	100	1	5	3.14	1.223	1.495	.200	.241	-1.055	.478
Valid N (listwise)	100									

Chatbot Experience (Part B)

- Mean scores: 3.47 – 3.72
- Highest: Timely responses (3.72)
- Lowest: Interaction felt natural (3.47)
- Customers find chatbots useful and fast, but less natural in interaction.

Virtual Assistant Experience (Part C)

- Mean scores: 3.46 – 3.84
- Highest: Understands queries (3.84), Trust for basic tasks (3.82)
- Lowest: Helpfulness/productivity (3.46)
- Customers view virtual assistants as accurate and trustworthy, but not always highly productive.

AI Tools (Part D)

- Mean scores: 3.57 – 4.32
- Highest: Personalization (4.32), Accurate information (4.19)
- Lowest: Speeds up process (3.57)
- AI tools are strongly associated with personalization and accuracy, but not always seen as the fastest.

Customer Service Efficiency (Part E)

- Mean scores: 3.95 – 4.18
- Highest: Issue resolved efficiently (4.18)
- Lowest: Seamless process (3.95)
- Customers agree service technology reduces waiting time and speeds resolution.

Customer Satisfaction (Part F)

- Mean scores: 3.96 – 4.11
- Highest: Expectations met (4.11)
- Lowest: Positive rating (3.96)
- Satisfaction is consistently high; expectations are largely met.

Customer Interaction (Part G)

- Mean scores: 2.88 – 4.28
- Highest: Could communicate issue easily (4.28)
- Lowest: Technology communicated clearly (2.88), Concerns understood (2.90)
- Mixed results, customers express issues easily but feel the system does not always understand or communicate clearly.

User Convenience (Part H)

- Mean scores: 2.86 – 3.10
- Highest: Technology available when needed (3.10)
- Lowest: No extra effort needed (2.86)
- Neutral responses, service is not always effortless or user-friendly.

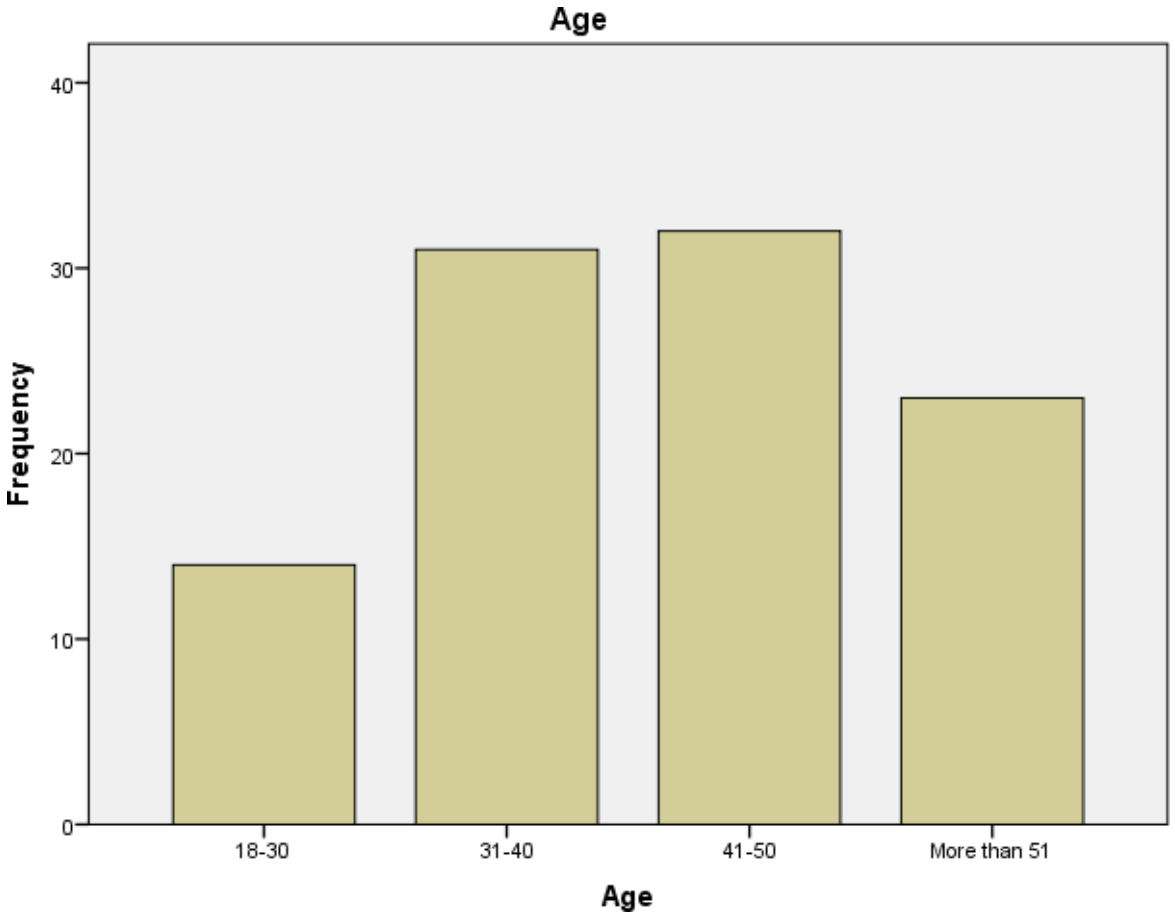
User Acceptance (Part I)

- Mean scores: 2.70 – 3.18
- Highest: Acceptance of AI in customer service (3.18)
- Lowest: Recommend to others (2.70)
- Customers are neutral to slightly positive toward AI, but reluctant to recommend it as a full alternative to humans.

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-30	14	14.0	14.0	14.0
	31-40	31	31.0	31.0	45.0
	41-50	32	32.0	32.0	77.0
	More than 51	23	23.0	23.0	100.0
	Total	100	100.0	100.0	

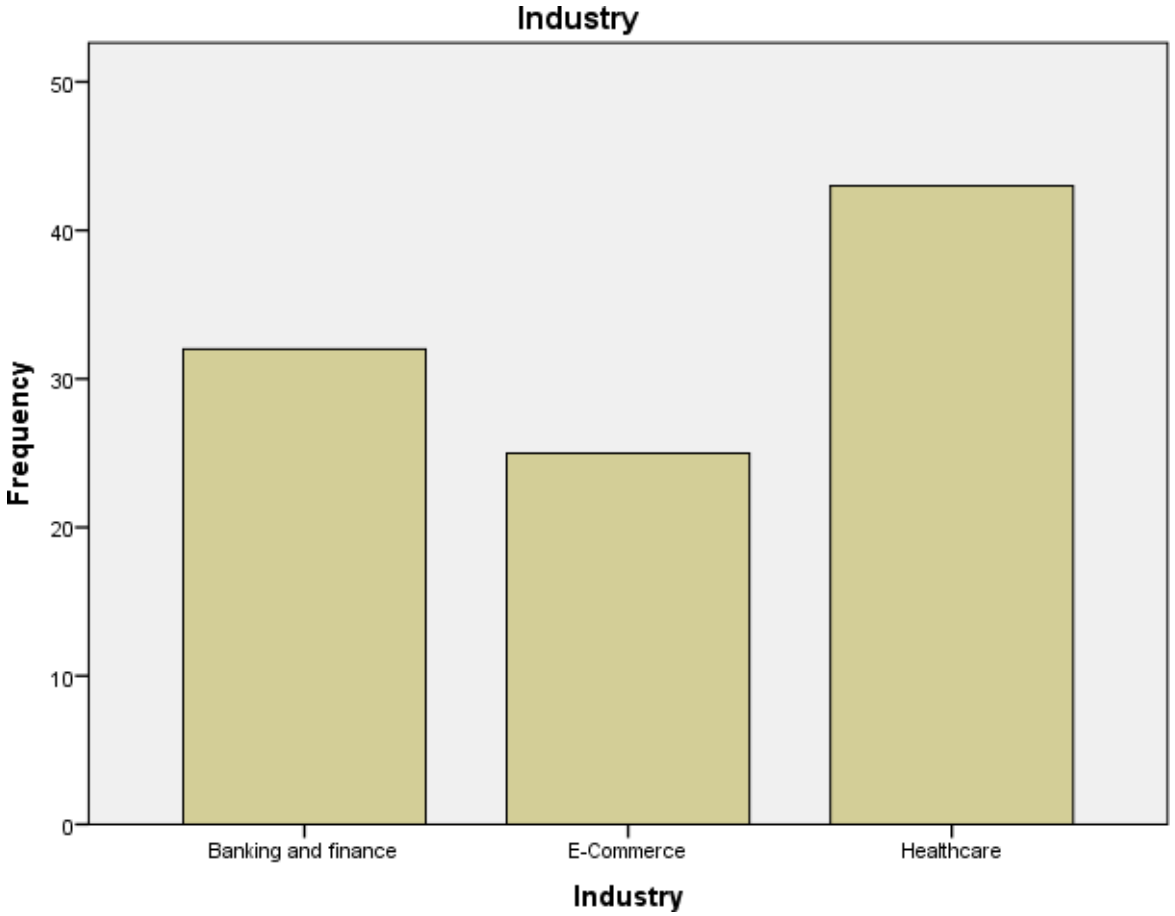
- 18–30 years: 14 respondents (14%)
- 31–40 years: 31 respondents (31%)
- 41–50 years: 32 respondents (32%)
- More than 51 years: 23 respondents (23%)
- Observation: The largest age group is 41–50 years (32%), while the smallest is 18–30 years (14%).



Industry

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Banking and finance	32	32.0	32.0	32.0
	E-Commerce	25	25.0	25.0	57.0
	Healthcare	43	43.0	43.0	100.0
	Total	100	100.0	100.0	

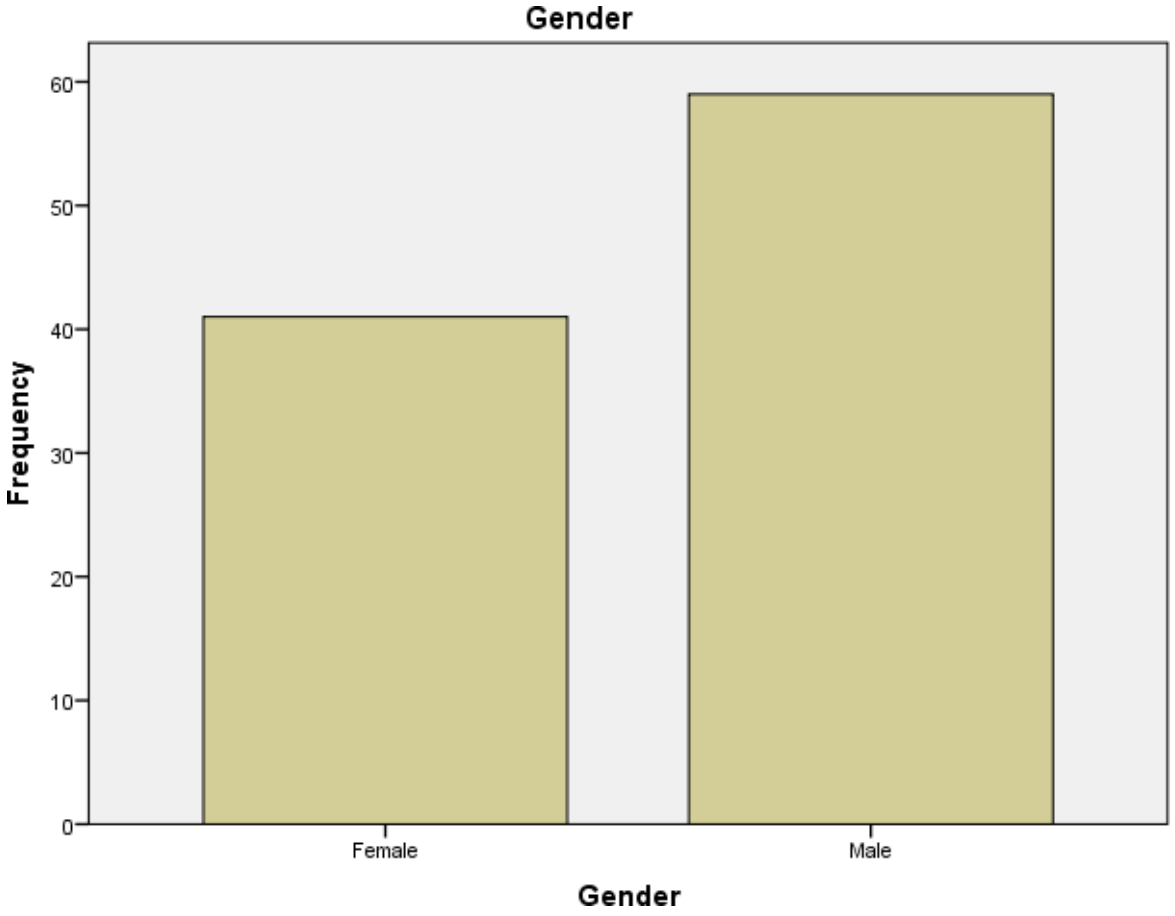
- Banking and Finance: 32 respondents (32%)
- E-Commerce: 25 respondents (25%)
- Healthcare: 43 respondents (43%)
- Observation: Healthcare sector dominates with 43%, while E-Commerce is the smallest group (25%)



Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	41	41.0	41.0	41.0
	Male	59	59.0	59.0	100.0
	Total	100	100.0	100.0	

- Female: 41 respondents (41%)
- Male: 59 respondents (59%)
- Observation: The sample is male-dominated (59%), with females representing 41%.



RQ1: How do chatbots improve response efficiency in customer service?

Case Processing Summary

		N	Marginal Percentage
Use of Chatbots	1.40	5	5.0%
	1.60	1	1.0%
	1.80	1	1.0%
	2.20	10	10.0%
	2.40	1	1.0%
	2.60	3	3.0%
	2.80	3	3.0%
	3.00	8	8.0%
	3.20	2	2.0%
	3.40	3	3.0%
	3.60	3	3.0%
	3.80	8	8.0%
	4.00	17	17.0%
	4.20	10	10.0%
	4.40	8	8.0%
	4.60	7	7.0%
	4.80	2	2.0%
	5.00	8	8.0%
Customer Service Efficiency	1.80	2	2.0%

	2.00	2	2.0%
	2.40	2	2.0%
	2.60	2	2.0%
	2.80	2	2.0%
	3.00	3	3.0%
	3.20	2	2.0%
	3.40	2	2.0%
	3.60	4	4.0%
	3.80	8	8.0%
	4.00	20	20.0%
	4.20	13	13.0%
	4.40	7	7.0%
	4.60	4	4.0%
	4.80	3	3.0%
	5.00	24	24.0%
Valid		100	100.0%
Missing		1	
Total		101	

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	329.765			
Final	283.121	46.643	15	.000

Link function: Logit.

- Chi-square = 46.643, df = 15, $p < 0.001$
- The model is statistically significant, meaning chatbot usage is a significant predictor of customer service efficiency

Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	334.189	240	.000
Deviance	220.285	240	.815

Link function: Logit.

- Deviance $\chi^2 = 220.285$, df = 240, $p = 0.815$
- Non-significant, indicating the model fits the data well.
- Pearson $\chi^2 = 334.189$, df = 240, $p < 0.001$
- Suggests some differences remain, but Deviance test shows overall acceptable fit.

Pseudo R-Square

Cox and Snell	.373
Nagelkerke	.375
McFadden	.089

Link function: Log .

- Cox & Snell = 0.373
- Nagelkerke = 0.375

- McFadden = 0.089
- Chatbot use explains ~37% of the variance in customer service efficiency (moderate effect).

Parameter Estimates

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[UseofChatbots = 1.40]	-5.176	.774	44.742	1	.000	-6.693	-3.659
	[UseofChatbots = 1.60]	-4.879	.712	46.894	1	.000	-6.275	-3.482
	[UseofChatbots = 1.80]	-4.647	.671	47.893	1	.000	-5.963	-3.331
	[UseofChatbots = 2.20]	-3.240	.507	40.793	1	.000	-4.234	-2.246
	[UseofChatbots = 2.40]	-3.143	.500	39.528	1	.000	-4.122	-2.163
	[UseofChatbots = 2.60]	-2.894	.482	35.999	1	.000	-3.839	-1.949
	[UseofChatbots = 2.80]	-2.680	.469	32.686	1	.000	-3.598	-1.761
	[UseofChatbots = 3.00]	-2.147	.439	23.922	1	.000	-3.008	-1.287
	[UseofChatbots = 3.20]	-2.023	.433	21.833	1	.000	-2.871	-1.174
	[UseofChatbots = 3.40]	-1.851	.425	18.990	1	.000	-2.683	-1.018
	[UseofChatbots = 3.60]	-1.689	.418	16.366	1	.000	-2.507	-.871
	[UseofChatbots = 3.80]	-1.275	.401	10.107	1	.001	-2.060	-.489
	[UseofChatbots = 4.00]	-.327	.376	.754	1	.385	-1.064	.411
	[UseofChatbots = 4.20]	.324	.377	.740	1	.390	-.414	1.062
	[UseofChatbots = 4.40]	.909	.393	5.350	1	.021	.139	1.680
	[UseofChatbots = 4.60]	1.584	.438	13.081	1	.000	.726	2.442
	[UseofChatbots = 4.80]	1.845	.465	15.764	1	.000	.934	2.755
Location	[CustomerServiceEfficiency=1.80]	-3.943	1.365	8.345	1	.004	-6.619	-1.268
	[CustomerServiceEfficiency=2.00]	-1.770	1.295	1.869	1	.172	-4.308	.768
	[CustomerServiceEfficiency=2.40]	-.001	1.287	.000	1	.999	-2.524	2.521
	[CustomerServiceEfficiency=2.60]	-25.046	.000	.	1	.	-25.046	-25.046
	[CustomerServiceEfficiency=2.80]	-3.943	1.365	8.345	1	.004	-6.619	-1.268
	[CustomerServiceEfficiency=3.00]	-.001	1.071	.000	1	.999	-2.100	2.098
	[CustomerServiceEfficiency=3.20]	.617	1.292	.228	1	.633	-1.916	3.150
	[CustomerServiceEfficiency=3.40]	-2.413	1.305	3.422	1	.064	-4.971	.144

	[CustomerServiceEfficiency=3.60]	-.128	.945	.018	1	.892	-1.979	1.723
	[CustomerServiceEfficiency=3.80]	-2.493	.751	11.025	1	.001	-3.965	-1.021
	[CustomerServiceEfficiency=4.00]	-1.889	.559	11.419	1	.001	-2.984	-.793
	[CustomerServiceEfficiency=4.20]	-.186	.603	.095	1	.757	-1.367	.995
	[CustomerServiceEfficiency=4.40]	-1.014	.758	1.793	1	.181	-2.499	.470
	[CustomerServiceEfficiency=4.60]	-.663	.947	.491	1	.484	-2.519	1.192
	[CustomerServiceEfficiency=4.80]	-.237	1.071	.049	1	.825	-2.336	1.862
	[CustomerServiceEfficiency=5.00]	0[a]	.	.	0	.	.	.

Link function: Logit.

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

- At lower chatbot usage (1.40 – 3.60) coefficients are negative & significant, showing low chatbot adoption decreases efficiency.
- At medium usage (3.80 – 4.00) results are mixed:
- 3.80, still significant negative (B = -1.275, p = 0.001)
- 4.00, non-significant (p = 0.385), neutral effect
- At higher usage (4.40 – 5.00) coefficients turn positive & significant:
- 4.40 B = 0.909, p = 0.021
- 4.60 B = 1.584, p < 0.001
- 4.80 B = 1.845, p < 0.001
- 5.00 baseline category
- Result: Regression confirms that greater chatbot usage improves customer service efficiency.
- Evidence: Model significant ($\chi^2 = 46.643$, $p < 0.001$), with moderate explanatory power (Nagelkerke $R^2 = 0.375$).
- Chatbots enhance response efficiency by speeding up service delivery and scaling support, but the benefits are realized only at higher adoption levels.

RQ2: What are the key advantages and limitations of virtual assistants?

Case Processing Summary

		N	Marginal Percentage
User Convenience	1.20	3	3.0%
	1.60	4	4.0%

Use of Virtual Assistants	1.80	6	6.0%
	2.00	3	3.0%
	2.40	19	19.0%
	2.60	3	3.0%
	2.80	18	18.0%
	3.00	10	10.0%
	3.20	4	4.0%
	3.60	6	6.0%
	3.80	4	4.0%
	4.00	6	6.0%
	4.40	7	7.0%
	4.60	4	4.0%
	4.80	3	3.0%
	1.40	3	3.0%
	1.60	4	4.0%
	2.00	1	1.0%
	2.40	10	10.0%
	2.80	5	5.0%
	3.00	6	6.0%
	3.20	6	6.0%
	3.40	4	4.0%
	3.60	2	2.0%
	3.80	9	9.0%
	4.00	12	12.0%
	4.20	4	4.0%
	4.40	14	14.0%
	4.60	8	8.0%
	4.80	2	2.0%
	5.00	10	10.0%
Valid		100	100.0%
Missing		1	
Total		101	

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	338.395			
Final	309.929	28.466	15	.019

Link function: Logit.

- Chi-square = 28.466, df = 15, p = 0.019
- The model is statistically significant, meaning use of virtual assistants predicts user convenience.

Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	570.981	195	.000
Deviance	248.185	195	.006

Link function: Logit.

- Deviance $\chi^2 = 248.185$, df = 195, p = 0.006, suggests some lack of fit.
- Pearson $\chi^2 = 570.981$, df = 195, $p < 0.001$, also indicates poor fit.
- Interpretation: The model is statistically valid, but virtual assistants explain the outcome only partially, convenience perceptions may also depend on other factors (e.g., personalization, trust, learning curve).

Pseudo R-Square

Cox and Snell	.248
Nagelkerke	.249
McFadden	.057

Link function: Log .

- Cox & Snell = 0.248
- Nagelkerke = 0.249
- McFadden = 0.057
- Virtual assistant use explains ~25% of the variance in user convenience (low–moderate effect).

Parameter Estimates

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[UserConvenience = 1.20]	-3.793	.812	21.802	1	.000	-5.385	-2.201
	[UserConvenience = 1.60]	-2.917	.681	18.339	1	.000	-4.252	-1.582
	[UserConvenience = 1.80]	-2.221	.625	12.646	1	.000	-3.445	-.997
	[UserConvenience = 2.00]	-1.953	.610	10.265	1	.001	-3.148	-.758
	[UserConvenience = 2.40]	-.758	.570	1.767	1	.184	-1.876	.360
	[UserConvenience = 2.60]	-.610	.568	1.151	1	.283	-1.723	.504
	[UserConvenience = 2.80]	.286	.564	.257	1	.612	-.820	1.393
	[UserConvenience = 3.00]	.848	.572	2.198	1	.138	-.273	1.970
	[UserConvenience = 3.20]	1.101	.578	3.627	1	.057	-.032	2.234
	[UserConvenience = 3.60]	1.531	.592	6.691	1	.010	.371	2.691
	[UserConvenience = 3.80]	1.868	.606	9.511	1	.002	.681	3.055
	[UserConvenience = 4.00]	2.453	.636	14.860	1	.000	1.206	3.700
	[UserConvenience = 4.40]	3.354	.706	22.539	1	.000	1.969	4.738

Location	[UserConvenience = 4.60]	4.281	.838	26.080	1	.000	2.638	5.924
	[UseofVirtualAssistants= 1.40]	-.957	1.161	.679	1	.410	-3.232	1.319
	[UseofVirtualAssistants= 1.60]	-.937	1.044	.805	1	.370	-2.982	1.109
	[UseofVirtualAssistants= 2.00]	-.684	1.844	.138	1	.711	-4.298	2.930
	[UseofVirtualAssistants= 2.40]	.815	.785	1.076	1	.300	-.725	2.354
	[UseofVirtualAssistants= 2.80]	-1.166	.970	1.445	1	.229	-3.066	.735
	[UseofVirtualAssistants= 3.00]	2.192	.930	5.553	1	.018	.369	4.015
	[UseofVirtualAssistants= 3.20]	2.173	.930	5.464	1	.019	.351	3.995
	[UseofVirtualAssistants= 3.40]	2.160	1.057	4.176	1	.041	.088	4.232
	[UseofVirtualAssistants= 3.60]	.208	1.355	.024	1	.878	-2.447	2.864
	[UseofVirtualAssistants= 3.80]	-.725	.809	.802	1	.371	-2.311	.862
	[UseofVirtualAssistants= 4.00]	-.294	.751	.153	1	.696	-1.765	1.178
	[UseofVirtualAssistants= 4.20]	-1.736	1.056	2.706	1	.100	-3.805	.332
	[UseofVirtualAssistants= 4.40]	-.234	.726	.104	1	.747	-1.656	1.188
	[UseofVirtualAssistants= 4.60]	.268	.830	.104	1	.747	-1.359	1.895
	[UseofVirtualAssistants= 4.80]	1.700	1.362	1.558	1	.212	-.969	4.368
	[UseofVirtualAssistants= 5.00]	0[a]	.	.	0	.	.	.

Link function: Logit.

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

- User Convenience thresholds:
- At low levels (1.20 – 2.00) coefficients are negative & highly significant ($p < 0.01$) meaning limited VA usage reduces convenience.
- At medium levels (2.40 – 3.20) coefficients move from neutral to slightly positive (some not significant, some borderline $p \approx 0.057$).
- At higher levels (3.60 – 4.60) coefficients become strongly positive & significant:
- 3.60 B = 1.531, p = 0.010
- 3.80 B = 1.868, p = 0.002
- 4.00 B = 2.453, p < 0.001
- 4.40 B = 3.354, p < 0.001

- 4.60 B = 4.281, p < 0.001
- Interpretation: As reliance on virtual assistants increases, the odds of reporting higher convenience rise steeply.
- Use of Virtual Assistants coefficients:
- Significant positive predictors found at:
- 3.00 B = 2.192, p = 0.018
- 3.20 B = 2.173, p = 0.019
- 3.40 B = 2.160, p = 0.041
- At these moderate usage levels, virtual assistants are strongly linked with higher perceived convenience.
- At very high levels (≥ 4.0), most effects are not significant possibly due to diminishing returns or limitations like errors, lack of human-like empathy.
- Virtual assistants provide clear advantages in convenience, efficiency, and contextual engagement at moderate adoption levels, but limitations emerge at very high reliance, where service quality may plateau, or frustrations appear.

RQ3: How does AI-driven personalization impact customer loyalty?

Case Processing Summary

		N	Marginal Percentage
User Acceptance	1.400	9	9.0%
	1.600	3	3.0%
	1.800	3	3.0%
	2.200	14	14.0%
	2.400	3	3.0%
	2.600	7	7.0%
	2.800	7	7.0%
	3.000	14	14.0%
	3.200	6	6.0%
	3.400	3	3.0%
	3.600	7	7.0%
	3.800	3	3.0%
	4.000	4	4.0%
	4.200	7	7.0%
	4.400	3	3.0%
	4.600	7	7.0%
Use of Artificial Intelligence Tools	2.00	2	2.0%
	2.20	6	6.0%
	2.40	2	2.0%

	2.80	2	2.0%
	3.00	1	1.0%
	3.40	6	6.0%
	3.60	2	2.0%
	3.80	10	10.0%
	4.00	19	19.0%
	4.20	14	14.0%
	4.40	13	13.0%
	4.60	3	3.0%
	4.80	9	9.0%
	5.00	11	11.0%
Valid		100	100.0%
Missing		1	
Total		101	

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	313.508			
Final	297.509	16.000	13	.249

Link function: Logit.

- Chi-square = 16.000, df = 13, p = 0.249
- The model is not statistically significant overall, meaning AI tool usage does not strongly predict customer loyalty (measured here via user acceptance).

Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	283.301	182	.000
Deviance	221.607	182	.024

Link function: Logit.

- Pearson $\chi^2 = 283.301$, df = 182, $p < 0.001$ suggests poor fit.
- Deviance $\chi^2 = 221.607$, df = 182, p = 0.024 also indicates misfit.
- Interpretation: The regression model does not adequately capture the relationship.

Pseudo R-Square

Cox and Snell	.148
Nagelkerke	.149
McFadden	.030

Link function: Log .

- Cox & Snell = 0.148
- Nagelkerke = 0.149
- McFadden = 0.030
- Only ~15% of the variance in user acceptance (proxy for loyalty) is explained by AI tool usage.

Parameter Estimates

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[UserAcceptance = 1.400]	-3.117	.635	24.123	1	.000	-4.360	-1.873
	[UserAcceptance = 1.600]	-2.781	.610	20.763	1	.000	-3.978	-1.585
	[UserAcceptance = 1.800]	-2.516	.595	17.870	1	.000	-3.682	-1.349
	[UserAcceptance = 2.200]	-1.647	.561	8.626	1	.003	-2.746	-.548
	[UserAcceptance = 2.400]	-1.496	.557	7.228	1	.007	-2.587	-.405
	[UserAcceptance = 2.600]	-1.153	.548	4.423	1	.035	-2.228	-.079
	[UserAcceptance = 2.800]	-.811	.542	2.238	1	.135	-1.874	.252
	[UserAcceptance = 3.000]	-.123	.535	.053	1	.818	-1.173	.926
	[UserAcceptance = 3.200]	.180	.536	.114	1	.736	-.869	1.230
	[UserAcceptance = 3.400]	.335	.537	.389	1	.533	-.717	1.387
	[UserAcceptance = 3.600]	.711	.542	1.720	1	.190	-.352	1.774
	[UserAcceptance = 3.800]	.884	.546	2.620	1	.105	-.186	1.955
	[UserAcceptance = 4.000]	1.146	.555	4.264	1	.039	.058	2.233
	[UserAcceptance = 4.200]	1.777	.589	9.094	1	.003	.622	2.931
	[UserAcceptance = 4.400]	2.178	.624	12.162	1	.000	.954	3.401
Location	[UseofArtificialIntelligenceTools=2.00]	-2.081	1.363	2.333	1	.127	-4.752	.589
	[UseofArtificialIntelligenceTools=2.20]	-1.965	.905	4.708	1	.030	-3.739	-.190
	[UseofArtificialIntelligenceTools=2.40]	.523	1.340	.152	1	.696	-2.102	3.149
	[UseofArtificialIntelligenceTools=2.80]	-.467	1.338	.122	1	.727	-3.091	2.156
	[UseofArtificialIntelligenceTools=3.00]	-.467	1.818	.066	1	.797	-4.031	3.096
	[UseofArtificialIntelligenceTools=3.40]	.526	.885	.353	1	.552	-1.209	2.261
	[UseofArtificialIntelligenceTools=3.60]	-1.232	1.345	.840	1	.359	-3.868	1.403
	[UseofArtificialIntelligenceTools=3.80]	-.883	.765	1.332	1	.248	-2.382	.616
	[UseofArtificialIntelligenceTools=4.00]	-.403	.660	.373	1	.541	-1.697	.891

	[UseofArtificialIntelligenceTools=4.20]	-1.017	.708	2.064	1	.151	-2.403	.370
	[UseofArtificialIntelligenceTools=4.40]	-.934	.718	1.689	1	.194	-2.341	.474
	[UseofArtificialIntelligenceTools=4.60]	-1.736	1.149	2.281	1	.131	-3.988	.517
	[UseofArtificialIntelligenceTools=4.80]	.273	.783	.122	1	.727	-1.261	1.807
	[UseofArtificialIntelligenceTools=5.00]	0[a]	.	.	0	.	.	.

Link function: Logit.

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

- User Acceptance (customer loyalty) thresholds:
- At low levels (1.4 – 2.6) coefficients are negative & significant ($p < 0.05$) low acceptance means weaker loyalty when AI tools are minimally used.
- At mid-range (2.8 – 3.8) coefficients are small/insignificant mixed effect.
- At higher levels (4.0 – 4.4) coefficients are positive & significant:
- 4.0 B = 1.146, p = 0.039
- 4.2 B = 1.777, p = 0.003
- 4.4 B = 2.178, p < 0.001
- Interpretation: Higher personalization through AI does enhance user acceptance and loyalty, but this trend is only strong at the upper end of user acceptance.
- Use of AI Tools (predictor):
- Most coefficients are non-significant.
- Only Use = 2.20 B = -1.965, p = 0.030 (negative, significant) meaning at low AI adoption, loyalty is reduced.
- At higher AI use levels (≥ 4.0), no significant positive effects were detected suggesting AI-driven personalization alone doesn't guarantee loyalty.
- Result: AI-driven personalization does not strongly predict customer loyalty overall (model not significant, p = 0.249).
- Variance explained: Only ~15% (Nagelkerke $R^2 = 0.149$).
- AI-driven personalization shows limited and conditional influence on customer loyalty. Customers respond positively only at higher levels of personalization

and acceptance, suggesting businesses must ensure quality and depth of personalization rather than just basic AI deployment.

Reliability Analysis

Reliability analysis is a process that determines the consistency of a measurement tool or scale. It helps to understand if a scale produces the same results under consistent conditions across multiple administrations. The range of Cronbach's alpha is mentioned below.

- **0.9 or higher**: Excellent
- **0.8 to 0.9**: Adequate
- **0.7 to 0.8**: Marginal
- **0.6 to 0.07**: Acceptable
- **Less than 0.6**: Totally unacceptable

Part B:

- Performed Reliability analysis to test the acceptance of the data.
- The Cronbach's alpha is given by 0.846 which is acceptable.

Case Processing Summary

		N	%
Cases	Valid	100	100.0
	Excluded[a]	0	.0
	Total	100	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.846	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
The chatbot was able to answer my queries effectively.	14.38	14.925	.752	.785
I found the chatbot easy to use and navigate.	14.37	15.670	.682	.806
The chatbot provided timely responses to my concerns.	14.27	16.785	.694	.805

I prefer using chatbots over waiting for a human representative.	14.42	16.893	.559	.840
My interaction with the chatbot felt natural and smooth.	14.52	18.010	.596	.829

Part C:

- Performed Reliability analysis to test the acceptance of the data.
- The Cronbach's alpha is given by 0.855 which is acceptable.

Reliability Statistics

Cronbach's Alpha	N of Items
.855	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Virtual assistants help me find solutions to service-related issues.	14.82	17.361	.608	.840
My experience with virtual assistants has been helpful and productive.	14.64	15.223	.770	.797
I find it convenient to use virtual assistants for customer support.	14.76	15.578	.746	.804
Virtual assistants understand my queries accurately.	14.44	16.774	.625	.836
I trust virtual assistants to handle basic customer service tasks.	14.46	16.130	.603	.844

Part D:

- Performed Reliability analysis to test the acceptance of the data.
- The Cronbach's alpha is given by 0.849 which is acceptable.

Reliability Statistics

Cronbach's Alpha	N of Items
.849	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted

AI-based tools help personalize my customer service experience.	15.69	10.620	.586	.836
I receive accurate information when AI tools are used in customer service.	15.82	10.088	.569	.844
I feel that AI tools speed up the service process.	16.44	9.198	.709	.804
I am comfortable with companies using AI tools for customer service.	15.99	10.212	.794	.790
I believe AI tools improve the quality of support I receive.	16.10	10.030	.677	.813

Part E:

- Performed Reliability analysis to test the acceptance of the data.
- The Cronbach's alpha is given by 0.902 which is acceptable.

Reliability Statistics

Cronbach's Alpha	N of Items
.902	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
The technology used made the customer service process faster.	16.33	10.567	.840	.863
I experienced minimal delays when using tech-based customer service.	16.26	10.881	.807	.871
My issue was resolved more efficiently with the help of technology.	16.24	10.649	.718	.888
I find that AI/chatbots/assistants reduce my waiting time.	16.38	10.521	.695	.894
The service technology made the overall support process seamless.	16.47	10.252	.741	.884

Part F:

- Performed Reliability analysis to test the acceptance of the data.
- The Cronbach's alpha is given by 0.889 which is acceptable.

Reliability Statistics

Cronbach's Alpha	N of Items
.889	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I feel good about the outcome of my tech-based customer service interaction.	16.08	12.519	.747	.861
I would rate my experience as positive when using service technology.	16.15	12.432	.792	.850
The use of digital tools made my experience more satisfying.	16.11	13.695	.703	.872
My expectations were met by the technology-enabled customer service.	16.00	12.222	.856	.836
I am satisfied with the support I received through service technology.	16.10	13.970	.569	.901

Part G:

- Performed Reliability analysis to test the acceptance of the data.
- The Cronbach's alpha is given by 0.686 which is acceptable.

Reliability Statistics

Cronbach's Alpha	N of Items

.686	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I did not face any difficulty while interacting with the chatbot/assistant/AI tool.	13.04	11.029	.324	.684
I could communicate my issue easily through technology.	12.74	11.103	.363	.667
The technology communicated clearly and effectively with me.	14.14	9.071	.569	.575
My concerns were understood correctly by the system.	14.12	9.157	.566	.576
I felt engaged during my interaction with the technology.	14.04	10.604	.388	.658

Part H:

- Performed Reliability analysis to test the acceptance of the data.
- The Cronbach's alpha is given by 0.778 which is acceptable.

Reliability Statistics

Cronbach's Alpha	N of Items
.778	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
It was easy to access the technology when I needed help.	11.98	16.949	.240	.829
I could use the service technology without needing assistance.	11.89	14.624	.571	.734
I found the process simple and user-friendly.	11.87	12.882	.848	.648
I did not have to spend extra effort to get support using the technology.	12.03	11.605	.565	.749
The technology was available when I needed customer support.	11.79	13.663	.665	.702

Part I:

- Performed Reliability analysis to test the acceptance of the data.
- The Cronbach's alpha is given by 0.717 which is acceptable.

Reliability Statistics

Cronbach's Alpha	N of Items
.717	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I would recommend others to use tech-based customer service solutions.	12.17	14.971	.520	.652
I believe this technology is a good alternative to human agents.	12.07	15.844	.404	.697
I accept the use of AI technologies in customer service.	11.69	14.216	.593	.621
I am comfortable relying on virtual assistants and chatbots.	11.82	15.402	.351	.727
I am open to using AI-based customer service again.	11.73	15.411	.545	.646

CHAPTER V: DISCUSSION

5.1 Discussion of Results aligned with LR

The findings indicate that chatbots have a positive impact on customer experience. Users believe that chatbots are effective, available, and able to provide the necessary support in time. The literature highlights that AI-powered chatbots are beneficial in analyzing lower cart abandonment rates and 24/7 personalized support, which in turn contributes to an increase in consumer interaction rates. In addition to this, it also helps in increasing response time, managing routine customer queries, and allowing human agents to use their productive hours for complex cases. It is determined that chatbots are overall worth in the context of providing customer service compared with human agents (Mangipudi, 2025). On the other

side, chatbots also influence responses and the rates of service resolution. It is evaluated that chatbots speed up customer service interactions and the indicators of customer service efficiency. Compared with the literature, it is identified that chatbots are effective and it has been noted that AI chatbots outperform human agents in the response time. However, in rates of resolution the latter has been observed to be significantly lower as well as to have greater rate of escalation frequency.

Further, considering the user satisfaction the findings indicated there is consistent high degree of satisfaction among users towards using chatbot-aided services. The literature stated that there is still a need for human agents in the customer satisfaction space, even though AI chatbots are much more effective and quicker. The results highlighted that chatbots were readily accessible and easy to communicate with. The literature stated that chatbots work together using CTI-enabled escalation providing optimum customer experience. AI chatbots support striking a balance between personalized service and efficiency. Additionally, chatbot performance varies according to industry.

Apart from this, the results discussed virtual assistant role in service innovation as VA support in resolving queries. The literature discussed that virtual assistants are also helpful in determining reduced cart abandonment rates and round-the-clock individualized assistance, both of which raise the frequency of customer interactions (Aldea, A., Kusumaningrum, M.C., Iacob, M.E. and Daneva, M., 2018). It is determined that virtual try-on tools allow customers to test makeup products virtually. The results indicated customer service improved by the implementation of AI in areas such as predictive analytics, sentiment analysis, and personalization. Compared with the literature, it is identified that AI-driven personalization in e-commerce regarding which case of Amazon and Shopify have been considered. Regarding AI-driven efficiency in e-commerce, the researchers believed that most online retailers, such as Amazon and Shopify, use AI in their systems to increase operational efficiency and reduce costs (Alasa, D.K., Hossain, D., Jiyane, G., Sarwer, M.H. and Saha, T.R., 2025). Researchers claim that by automating restocking, improving demand forecasting, and streamlining supply chain operations, the use of AI-driven inventory management has transformed e-commerce platforms, like Amazon and Shopify. With the help of AI, Amazon can distribute products more effectively, cutting down on delivery times and logistical expenses while minimizing stockouts and overstocking. AI may be used to swiftly assist customers in identifying products using chatbots that interact with customers and provide them with a positive shopping experience. AI-driven personalization has radically changed how consumers

interact with e-commerce by improving the user experience and increasing sales conversion efficiency.

The results highlighted predictive analytics are an important aspect of AI that support anticipate customer needs and deploy solutions in advance. It shows that AI is capable of accurately predicting user intent and offering prompt, proactive assistance. In addition, AI can make relevant recommendations based on past exchanges and user preferences, allowing for more individualized help. The literature highlighted that Predictive analytics has been shown to support inventory control and delivery process improvement, guaranteeing prompt fulfilment and great customer satisfaction. According to the researchers, Zappos' strategy demonstrates how analytics AI may be applied to increase operational effectiveness and solid customer relationships in the fiercely competitive e-commerce market for clothing and footwear (Gupta and Parween, 2025).

5.2 Discussion of Research Question One?

Why chatbots outperform humans in routine queries but struggle with complexity

Comparative research was carried out on the observations linked with AI implementation in companies such as Sephora, Amazon with other companies by analyzing of human agents as compared to chatbots in context to customer services discussed. The researcher emphasized on conducting compatible research on AI powered chatbots as compared to human agent, in the context of customer satisfaction. It has been noted that AI chatbots can be faster with human agents. Yet, in the rates of resolution, the later has been observed to be significantly lower as well as possessing a greater rate of escalation frequency. The research results have disclosed that, as far as AI chatbots and customer satisfaction are concerned, despite the great efficiency and speed of the AI chatbots, the human agents are still needed. Human agents have been observed to be specifically applicable in complex and emotionally charged interactions. Based on the observation that it has been opined that in human dealings and solving issues with customers through emotional intelligence, there is always possibility that customer satisfaction would be on higher side. The scholars have also examined hybrid scenarios in which human agents and AI chatbots collaborate with the application of CTI-facilitated escalation to deliver the best customer experience (Mangipudi, 2025).

The researchers have also examined hybrid scenarios in which AI chatbots and human agents collaborate through CTI-enabled escalation to deliver the best possible customer experience. The study's conclusions have shown that, from the perspective of the client, CTI integration

makes switching between human agents and AI simple and causes little dispute. Based on the data, the researchers have concluded that hybrid models, which help to balance efficiency and personalized service, yield the best outcomes when human agents are assisted by AI chatbots. The study offers a comprehensive understanding of the advantages of chatbots, human agents, and a hybrid model that offers a thorough grasp of various likely scenarios. It is analysed that AI chatbot performance varies based on industry further affected the generalizability of the study. Chatbots are also beneficial in determining lower cart abandonment rates and 24/7 personalized support contribute to an increase in consumer interaction rates.

Apart from this, chatbots with AI capabilities improve response times, handle common customer inquiries, and free up human agents' productive hours for more complicated situations. Predictive analytics has also been shown to aid in inventory control and delivery process optimization, guaranteeing prompt fulfilment and great customer satisfaction.

5.3 Discussion of Research Question Two?

How virtual assistants enhance accessibility but raise privacy concerns

Virtual assistants are also helpful in determining reduced abandoned cart rates and round-the-clock individualized assistance, both of which raise the frequency of customer interactions. In the study technology acceptance theories were adopted in terms of AI-based intelligent products. It has been observed that when it came to predicting the acceptability of AI-based intelligent products, the Value-based Adoption Model (VAM) performed the best. According to an analysis of the model, TAM serves as its foundation, with an emphasis on the perceived value that a technology offers when considering its advantages and the necessary modifications. According to this concept, users evaluate a technology's perceived advantages against its perceived drawbacks, which include costs, hazards, and effort, before deciding whether to use it (Sohn and Kwon, 2020). It is evaluated that this model proposed alternatively of TAM which was not effective in considering the influence of exogenous variables in explaining intention to use new ICT considering mobile internet. The researcher indicated the aspects of cost-benefit VAM retained the technical features that included technicality and usefulness of the existing technology acceptance theories, incorporating perceived fee. VAM involves perceived values, which is not included in other models. The model has been used for elaborating on the acceptance of IPTV, mobile payments, and IoT services.

Furthermore, theory of planned behaviour is another theory mentioned by the researcher for explaining intention to act. This theory is an extension of Theory of Reasoned Action (TRA). In TPB the constructs have been used when introducing the constructs of attitude and perceived behavioural control and subjective norms for explaining the intention to act. The importance of societal factors on acceptance that affect individual behaviour is related to subjective norms, according to the study (Jain, V., Wadhwani, K. and Eastman, J.K., 2023). On the other hand, in contrast to perceived ease of use in TAM, perceived behaviour control that influences individual behaviour exhibits practicality. The idea is used in studies on the adoption of novel products that look at external variables, like social impact. Consistent with this, research has focused on the several external elements that are linked to intelligent products.

In the study, UTAUT theory was adopted and it was formulated by redefining representative technology acceptance theories for instance, TAM, TRA, and TPB. The researchers believed that social influence, facilitation circumstances, effort expectancy, and performance expectancy were the primary components of the theory. Similarly, there are several external elements that have been studied in academic research for intelligent goods. Learning new technology is correlated with enjoyment. Although AI technology is a very interesting idea from a social point of view, it has not yet been applied in the real world, so prospective customers are still swayed by other people's ideas before embracing AI-based intelligent products (Sung, 2021). Apart from this, stimulus organism response theory of mind and self-expansion theory are the commonly used psychological theories. There have also been reports of consumers making judgments in areas like shopping in a considerably less vulnerable state. It has been shown that consumer acceptance of AI technology is influenced by psychological characteristics, such as risk aversion, consumer values, and the reasoning process involved in adoption. The cluster has also tackled consumer trust and acceptance of AI in the consumption process.

5.4 Discussion of Research Question Three?

AI’s role in fostering loyalty through hyper-personalization.

AI-powered personalization in e-commerce, with a focus on Shopify and Amazon as examples. Regarding AI-driven efficiency in e-commerce, the researchers believed that most online retailers, such as Amazon and Shopify, use AI in their systems to increase operational efficiency and reduce costs. The researchers claim that by automating restocking, improving

demand forecasting, and streamlining supply chain operations, the use of AI-driven inventory management has changed e-commerce platforms, including Amazon and Shopify. Amazon uses AI to distribute products dynamically, which lowers delivery times, logistical costs, and the likelihood of overstocking or stockouts (Dushnitsky and Stroube, 2021).

The study also noted that Shopify stores use AI-powered supply chain solutions to streamline restocking tactics, which lowers inventory maintaining costs. With the aid of real-time price adjustments based on competition pricing, dynamic pricing strategies, market trends, and customer demand, AI has also helped these businesses increase conversion rates. E-commerce businesses have been able to increase revenue through efficient order fulfilment, manage stock levels, and enhance customer satisfaction by integrating AI into pricing and inventory (Shaikh, 2023). AI is being used in several ways, including automated chatbots for client engagement. AI may be used to swiftly assist customers in identifying products using chatbots that interact with customers and provide them with a positive shopping experience. The study found that AI-driven personalization has revolutionized e-commerce customer interaction by improving the user experience and increasing sales conversions. The application of AI-driven personalization in competitive e-commerce platforms helps these businesses improve product discovery while also boosting engagement and enduring consumer loyalty. Amazon is one corporation that has implemented AI to manage their online businesses. With them, advertising and product listings can be created. Generative artificial intelligence (Gen AI) has revolutionized the way that Amazon's suppliers and customers make purchases on the digital marketplace. Customers can more quickly locate a wide range of products, while platform vendors can operate their stores more effectively. The AI makes it easier to create narrative content. Additionally, tiny businesses who might lack the resources to produce unique, high-quality content might employ these technologies. A video-generating AI technology may also launch a video product from a single product photograph. Shopify and Amazon offer these services to sellers who may not have the capacity to create such material (MacKenzie, I., Meyer, C. and Noble, S., 2019).

Chapter VI: SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

6.0 Introduction

This research focused on technologies and innovations in service highlighted the role of chatbots, virtual assistants, and artificial intelligence (AI) in transforming customer service. The study was primarily motivated by the following two objectives: the first being measuring the influence of AI-based tools on customer experience, responsiveness, and overall service efficiency; the second being discovering deeper human perceptions and emotional responses related to the usage of such technologies that could help in revealing the insights beyond the simple interaction level.

They used a mixed-methods strategy that was both comprehensive and balanced. It combined descriptive and exploratory research designs to achieve a balanced view of the quantitative and qualitative data. The descriptive part dealt with the measurable aspects of service such as response times, customer satisfaction, and usability scores and thus made it possible to recognize the essential patterns, relationships, and trends that demonstrate how AI tools have not only speeded up customer service operations but also ensured the consistency of service delivery.

The exploratory part, on the other hand, went beyond the surface level of customer interactions with technology by investigating the context, psychology, and emotions of technology adoption and, in particular, how trust, empathy, and user comfort impact the overall acceptance and success of AI-driven service technologies. Hence, it facilitated a better understanding of the customer engagement process that faces challenges when integrating intelligent systems and, at the same time, discovers new opportunities,Deloitte. (2021). The first methodological approach, combined with the second one as well as the latter's results, created a solid ground not only for evaluating AI's operational benefits but also its implications for the human experience. By linking technological performance with human interaction, the research finds out that although AI technologies strongly support efficiency and scalability, human emotion and empathy are still necessary to create meaningful service experiences.

At the end, the study, through its contribution, sheds light on the intricate interplay of human and intelligent service technologies and points out that the real breakthrough is not the full automation of customer service but rather the co-existence of automation and authentic human connection.

6.1 Summary

The results from this research study show that, as a service technology powered by artificial intelligence, chatbots have improved the customer experience and organizational efficiency in a very clear way. Customers see chatbots as extremely good, trustworthy, and available tools that can provide them with fast help in different service channels. This goes in line with the main literature that says AI-powered chatbots are the main contributors to the customer engagement because they reduce the cart abandonment rates, give 24/7 personalized support, and make the communication between customers and service providers more easy and fast. These mechanisms improve the time for the response, are capable of handling the most common questions in a very efficient way and thus, can make the human agents free to solve the more complicated customer problems that have emotional characters, therefore, can lead to the overall productivity optimization,Gartner. (2023). On one hand, empirical data and academic dialogues together support that chatbots are excellent in accomplishing customer service tasks and sometimes they can be better than human agents especially in matters like pace, uniformity, and availability.

On the other hand, the research has recognized some restrictions in the functionalities of chatbots. Even if chatbots are characterized with better response times and hence are the contributors to the fast service delivery, they have low resolution rates, especially in the sectors where they are dealing with complicated or even emotionally sensitive customer issues, Floridi, L., Cowls, J., Beltrametti, M (2018). Thereby, they often escalate due to this consequence, indicating that though they are efficient, human intervention is still necessary for the accomplishment of more complicated tasks by chatbots. When compared to the literature, the results emphasize that the implementation of AI-driven chatbots should not imply the absence of human customer service agents but rather the lessening of human workload and collaboration between them. Chatbots and virtual assistants are good at dealing with scripted and monotonous tasks while when tasks require empathy, contextual knowledge, or advanced problem-solving skills, human agents should be engaged.

Regarding customer satisfaction, the study identifies a consistently high degree of satisfaction among users who engage with chatbot-assisted services. Participants find these tools easy to use, accessible, and communicative. Nonetheless, the literature reiterates the continuing importance of human touch in maintaining deeper customer satisfaction. Hybrid models that combine chatbots with Computer Telephony Integration (CTI)-enabled escalation systems are seen as the most effective, ensuring customers receive both efficient and empathetic service,Gnewuch, U., Morana, S., & Maedche, A. (2017). The findings also highlight that chatbot performance varies across industries, with sectors like e-commerce showing particularly strong benefits from AI integration.

In competitive digital marketplaces, AI-driven personalization has become a defining factor for customer engagement and loyalty. Platforms such as Amazon have successfully leveraged generative AI (Gen AI) to revolutionize product discovery, advertising, and content creation, allowing both customers and vendors to navigate the marketplace more effectively. Smaller businesses also benefit from AI innovations, such as automated video and product content generation, which reduce marketing costs and enhance brand visibility.

6.2 Implication of study

The implications of this study are multifaceted, spanning academic contribution, practical relevance, and policy formulation. From an academic standpoint, the research enriches the growing body of knowledge that connects service innovation, human-computer interaction, and artificial intelligence (AI), Gnewuch, U. (2022). While there exists extensive theoretical work on AI and customer service independently, an integrative analysis that collectively examines chatbots, virtual assistants, and AI systems within a unified analytical framework has been largely absent. This study fills that gap by providing conceptual clarity and empirical depth on how service technologies co-evolve with organizational goals and customer expectations. Grounded in established behavioural theories such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), the study contributes a theoretically sound understanding of the psychological and contextual factors influencing user acceptance, trust, and satisfaction with AI-driven customer service tools. Consequently, it offers a structured academic foundation for future research on the interplay between automation, human emotion, and customer experience design in digital service contexts.

From a practical business perspective, the study holds substantial value for organizations striving to integrate AI technologies effectively into their customer service frameworks. As firms increasingly embrace digital service channels, they face mounting pressure to remain responsive while reducing operational costs and maintaining service quality,Gursoy, D., Chi, C. G., Lu, L., & Nunkoo, R.. (2019). The findings of this research provide actionable insights into how businesses can implement AI-based customer service systems strategically identifying best practices, key performance benchmarks, and patterns of user feedback. For instance, the study helps firms understand how to design chatbot interfaces that align with their brand tone and service complexity, as well as how to balance automation with human intervention for optimal customer satisfaction.

Furthermore, it highlights how AI can enhance responsiveness and consistency, freeing human agents to handle complex or emotionally charged customer interactions that require empathy and contextual understanding. This evolving division of labour necessitates a rethinking of workforce roles, emphasizing the need for targeted employee training, revised performance metrics, and adaptive management structures,Hoy, M. B. (2018). Managers can use insights from this study to plan seamless transitions toward hybrid service models where humans and machines collaborate effectively to achieve superior service delivery.

In terms of policy implications, the study underscores the pressing need for robust frameworks governing ethical AI deployment and data protection. As AI systems process vast amounts of personal and transactional data, concerns about privacy, transparency, and accountability become increasingly important. This research contributes to the ongoing policy dialogue by identifying regulatory gaps and advocating for clearer standards such as explicit disclosure when customers interact with AI rather than humans and improved mechanisms for safeguarding sensitive information, Huang, M. H., & Rust, R. T. (2021). The issue of algorithmic bias also emerges as a critical concern; biased datasets can lead to discriminatory outcomes or miscommunication, particularly for non-native speakers or underrepresented groups. The study proposes inclusive data collection practices, regular algorithmic audits, and user feedback mechanisms as essential measures for ensuring fairness and reliability. These recommendations are especially relevant for highly regulated sectors like finance, healthcare, and public services, where ethical lapses can have far-reaching consequences.

Additionally, the study calls attention to the need for governmental and institutional support to assist small and medium-sized enterprises (SMEs) in navigating digital transformation. While large corporations can afford to experiment with AI solutions, SMEs often face financial and technical constraints, Huang, M.-H., & Rust, R. T. (2018). The research highlights the importance of creating enabling ecosystems through subsidized training programs, open-source AI toolkits, and vendor certifications to democratize access to digital service innovation. Lastly, the study gains further relevance in the post-pandemic context, as organizations have accelerated digital transformation to sustain service continuity amid disruptions. Chatbots and virtual assistants played a crucial role in mitigating service breakdowns and supporting customers during the COVID-19 crisis, underscoring the resilience and necessity of AI-driven service infrastructure.

6.3 Recommendations for Future Research

The first direction for future research to consider is long term studies, which are necessary to see the change of users' perceptions, satisfaction and even organizational results as AI technologies advance and mature. Such studies could provide valuable information about the effects over time of AI implementation on loyalty of customers, adaptation of employees, and general quality of service.

Second, comparative studies cross-industries will be very valuable in opening the current research by showing the differences of how various industries such as medicine, banking, hospitality, retail, and education use and implement AI according to their service needs, rules, and customer expectations,IBM. (2020). These comparisons would disclose the best practices in the adoption of specific sectors and the barriers facing them, which in turn, will help in addressing these issues.

Besides that, future researchers might also consider investigating psychological and cultural aspects that affect the consumer acceptance of AI-powered customer service and also investigate these factors in diverse demographic and geographic contexts,Juniper Research. (2020). Studying aspects such as trust, empathy, and perceived transparency in various cultural settings may provide useful information on how AI should be crafted and localized.

In addition, research could delve into the ethical and social side of AI in customer service by focusing on issues like algorithmic bias, data privacy, and providing clear accountability avenues in order to facilitate the implementation of fair and responsible AI. There is another

possibility of incorporating forthcoming technologies like generative AI, emotion recognition systems, and voice-enabled assistants into customer service frameworks to study how multimodal interactions influence user satisfaction and engagement,Lemon, K. N., & Verhoef, P. C. (2016). To sum up, the next research could employ experimental and simulation-based methods to investigate how AI-human collaboration models can lead to optimal task distribution thus enhancing both efficiency and empathy in customer service departments.

6.4 Conclusion

To recap, the present research has manifested that service technology and innovation, in particular, chatbots, virtual assistants, and artificial intelligence, have a transformative effect on the customer service sphere. The main takeaway from the study is that these advanced tools powered by AI can do to a large extent the dull, monotonous and data-heavy tasks of customer relations but they still need humans to solve those complicated ones which require empathy and understanding of the context, Kumar, A., Dixit, A., Javalgi, R. G., & Dass, M. (2019).

The paper exposes a paradox of sorts: while it is true that AI machines can easily undertake the repetitive work of a data-driven nature, human intervention is still indispensable when handling the emotional side of conversations and extracting subtle nuances of context. Arguing on the constructive quality of the relationship between human and artificial intelligence, the researchers conclude that customer service performance can be optimal when employing hybrid models which entail both technological accuracy and emotional skills.

On top of that, the paper is another piece of the puzzle in the ongoing academic debate - it combines behavioural theories with empirical data to deliver theoretical understanding of device acceptance and human-AI interaction. In real life terms, it acts as a roadmap for companies that want to introduce AI in a proper and productive manner, giving along the way tips on execution, employee transition, and customer involvement.

On a policy level, it emphasizes the ethical need for AI governance, data protection, and inclusion and, thereby, supports the call for establishing norms that ensure transparency and fairness. In the end, the current work is supportive of the idea that customer service will be better if humans work hand in hand with technology rather than if one of the two is substituted by the other, Liu, Y., Ginther, D., & Madey, G. (2008). The complementarity,

driven by innovation and empathy, is the key to unlocking the customer-centric service ecosystems of tomorrow which are sustainable, efficient, and compatible with the digital trend.

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APPENDICES

Appendix A

Questionnaire Development

On

The Impact of Service Technology and Innovation on Customer Service: An Exploration of Chatbots, Virtual Assistants, and Artificial Intelligence

This questionnaire was developed to gather relevant information from customers regarding the influence of service technology and innovation on customer service. More specifically, the questionnaire intends to gather information from these respondents regarding the impact of chatbots, virtual assistance and AI on customer service. The questionnaire given below is a tool chosen for collecting data for the research project titled "**The Impact of Service Technology and Innovation on Customer Service: An Exploration of Chatbots, Virtual Assistants, and Artificial Intelligence**". The participants are requested to respond attentively to all of the questions mentioned below. The respondents are assured that the information they provide will be used for research purposes only and will be kept confidential and unidentifiable to an individual or organisation.

Part A: Demographic Questions

Please select one appropriate option for the questions mentioned below.

1. Age

a. Under 25

b. 25–34

c. 35–44

d. 45–54

e. 55–64

f. 65 and above

2. Gender

a. Male
b. Female
c. Prefer not to disclose.

3. Highest Level of Education

a. No formal education
b. High school or equivalent
c. Diploma/Certificate course
d. Bachelor's degree
e. Master's degree
f. Doctoral degree
g. Other

4. Current Employment Status

a. Employed full-time
b. Employed part-time
c. Self-employed
d. Unemployed
e. Student
f. Retired
g. Other

5. Sector in which service technology is used primarily

a. Banking and finance
b. E-commerce / Online shopping
c. Telecommunications
d. Healthcare
e. Travel and tourism
f. Government services
g. Education
h. Others

6. Frequency of interaction with Chatbots, Virtual Assistance or AI

a. Daily
b. A few times a week

c. Once a week
d. A few times a month
e. Rarely
f. Neve

Part B: Qualitative Questions

1. How is your overall experience in the context of interacting with AI-powered customer service, such as chatbots or virtual assistants?
2. In your opinion, what manner does chatbots, virtual assistants, and other AI tools influence the overall efficiency of customer service?
3. How satisfied are you with your interactions when using chatbots or virtual assistants compared to human agents?
4. In what manner have AI-powered tools such as chatbots and virtual assistants changed the way you interact with customer service teams?
5. Can you describe a time when an AI tool (chatbot or virtual assistant) helped you resolve an issue quickly? What made the experience efficient?
6. In your view, how does AI compare with human customer service in terms of speed and convenience?
7. Have you noticed any improvements in the way AI services recognise your preferences or past interactions over time? Please describe.
8. According to you, how do chatbots contribute to faster response times or quicker issue resolution during customer service interactions?
9. In your opinion, how convenient do you think chatbots or virtual assistants are for resolving your service-related queries?
10. What are the factors that affect your likelihood of accepting and continuing to use AI-powered customer service tools?

Appendix B

Questionnaire Development

On

THE IMPACT OF SERVICE TECHNOLOGY AND INNOVATION ON CUSTOMER SERVICE: AN EXPLORATION OF CHATBOTS, VIRTUAL ASSISTANTS, AND ARTIFICIAL INTELLIGENCE

The primary objective of this questionnaire is to obtain relevant information from different customers in three industries. The Questionnaire given below is a tool that has been chosen for gathering data for the research project titled **"THE IMPACT OF SERVICE TECHNOLOGY AND INNOVATION ON CUSTOMER SERVICE: AN EXPLORATION OF CHATBOTS, VIRTUAL ASSISTANTS, AND ARTIFICIAL INTELLIGENCE".** The respondents are thus requested to respond attentively to all the questions. Please be assured that the information obtained from this questionnaire will be used for research purposes only and will be kept confidential.

Part A: Demographic Information

Please select one appropriate option in each of the following questions:

1. **Age**

- 18 - 30 Years
- 31 - 40 Years
- 41 - 50 Years
- More Than 51 Years

2. **Industry?**

- E-commerce

- Banking and Finance
- Healthcare

3. Gender

- Male
- Female
- Others

Part B: Use of Chatbots

On a scale of 1-5, please indicate the degree to which you agree to the statements given below based on your experience. (SD = Strongly Disagree, D = Disagree, N = Neither Agree nor Disagree, A = Agree, SA = Strongly Agree)

Statements	SD	D	N	A	SA
The chatbot was able to answer my queries effectively.					
I found the chatbot easy to use and navigate.					
The chatbot provided timely responses to my concerns.					
I prefer using chatbots over waiting for a human representative.					
My interaction with the chatbot felt natural and smooth.					

Part C: Use of Virtual Assistants

On a scale of 1-5, please indicate the degree to which you agree to the statements given below based on your experience. (SD = Strongly Disagree, D = Disagree, N = Neither Agree nor Disagree, A = Agree, SA = Strongly Agree)

Statements	SD	D	N	A	SA

Virtual assistants help me find solutions to service-related issues.					
My experience with virtual assistants has been helpful and productive.					
I find it convenient to use virtual assistants for customer support.					
Virtual assistants understand my queries accurately.					
I trust virtual assistants to handle basic customer service tasks.					

Part D: Use of Artificial Intelligence Tools

On a scale of 1-5, please indicate the degree to which you agree to the statements given below based on your experience. (SD = Strongly Disagree, D = Disagree, N = Neither Agree nor Disagree, A = Agree, SA = Strongly Agree)

Statements	SD	D	N	A	SA
AI-based tools help personalize my customer service experience.					
I receive accurate information when AI tools are used in customer service.					
I feel that AI tools speed up the service process.					
I am comfortable with companies using AI tools for customer service.					
I believe AI tools improve the quality of support I receive.					

Part E: Customer Service Efficiency

On a scale of 1-5, please indicate the degree to which you agree to the statements given below based on your experience. (SD = Strongly Disagree, D = Disagree, N = Neither Agree nor Disagree, A = Agree, SA = Strongly Agree)

Statements	SD	D	N	A	SA
The technology used made the customer service process faster.					
I experienced minimal delays when using tech-based customer service.					
My issue was resolved more efficiently with the help of technology.					
I find that AI/chatbots/assistants reduce my waiting time.					
The service technology made the overall support process seamless.					

Part F: Customer Satisfaction

On a scale of 1-5, please indicate the degree to which you agree to the statements given below based on your experience. (SD = Strongly Disagree, D = Disagree, N = Neither Agree nor Disagree, A = Agree, SA = Strongly Agree)

Statements	SD	D	N	A	SA
I feel good about the outcome of my tech-based customer service interaction.					
I would rate my experience as positive when using service technology.					
The use of digital tools made my experience more satisfying.					
My expectations were met by the technology-enabled customer service.					

I am satisfied with the support I received through service technology.					

Part G: Customer Interaction

On a scale of 1-5, please indicate the degree to which you agree to the statements given below based on your experience. (SD = Strongly Disagree, D = Disagree, N = Neither Agree nor Disagree, A = Agree, SA = Strongly Agree)

Statements	SD	D	N	A	SA
I did not face any difficulty while interacting with the chatbot/assistant/AI tool.					
I could communicate my issue easily through technology.					
The technology communicated clearly and effectively with me.					
My concerns were understood correctly by the system.					
I felt engaged during my interaction with the technology.					

Part H: User Convenience

On a scale of 1-5, please indicate the degree to which you agree to the statements given below based on your experience. (SD = Strongly Disagree, D = Disagree, N = Neither Agree nor Disagree, A = Agree, SA = Strongly Agree)

Statements	SD	D	N	A	SA
It was easy to access the technology when I needed help.					

I could use the service technology without needing assistance.					
I found the process simple and user-friendly.					
I did not have to spend extra effort to get support using the technology.					
The technology was available when I needed customer support.					

Part I: User Acceptance

On a scale of 1-5, please indicate the degree to which you agree to the statements given below based on your experience. (SD = Strongly Disagree, D = Disagree, N = Neither Agree nor Disagree, A = Agree, SA = Strongly Agree)

Statements	SD	D	N	A	SA
I would recommend others to use tech-based customer service solutions.					
I believe this technology is a good alternative to human agents.					
I accept the use of AI technologies in customer service.					
I am comfortable relying on virtual assistants and chatbots.					
I am open to using AI-based customer service again.					