Potential Impact of Automation Technology in the IS/IT Customer Service Industry

Jenny Feith

A dissertation submitted to the University of Dublin
in partial fulfilment of the requirements for the degree
of MSc in Management of Information Systems

11th June, 2018

Declaration

I declare that the work described in this dissertation is, except where otherwise stated, entirely my own work, and has not been submitted as an exercise for a degree at this or any other university. I further declare that this research has been carried out in full compliance with the ethical research requirements of the School of Computer Science and Statistics.

Signed: _____

Jenny Feith

11th June, 2018

Permission to lend and/or copy

I agree that the School of Computer Science and Statistics, Trinity College may lend or copy this dissertation upon request.

Signed: _____

Jenny Feith

11th June, 2018

Acknowledgements

I would like to thank my supervisor, Maria Loomes, for her guidance and advice as I researched and wrote this dissertation.

I'd like to thank my friends and colleagues for their help and encouragement, which sustained me. In particular, I'd like to thank Andreas Franz for his supportive and kind words and for always believing in me.

I will be forever grateful to my employer, especially my manager Jessica Eisner, for supporting me in achieving my goals. Without their support and encouragement through the years, I could not have successfully completed my academic journey.

I'm thankful to my boyfriend Ferran Barneda for his patience, support, and understanding with me over the last two years.

Finally, I would like to thank the participants who took part in this research for their time and valuable input; without them this research would not have been possible.

Abstract

Our era is marked by rapid technological advancement, and one area of technology that is especially relevant right now is artificial intelligence (AI). The use of AI is not only reshaping our personal lives but also impacting how we work and whether certain jobs will continue to be executed by people. This study examines the potential impact such intelligent-automation technology will have, specifically in the information services and information technology customer-service industry. An interpretive research approach was used throughout the study. Semi-structured interviews were conducted with eight participants of different customer-service organisations, each offering in-depth insight into their opinions of and experience with the application of AI technology for customer-service process automation. The participants were all at the managerial level or higher and were key decision-makers in their respective customer-service departments. The findings indicate that the research area is relevant for each of the participants. Various use-cases for the application of AI for customer-service departments have been identified, such as intelligent ticket-request routing based on foreign language recognition and assistance for agents through automatic answer suggestions. The main challenges and barriers to adoption that have been identified are the amounts of data needed to train AI, privacy concerns, the rarity of people with the right expertise to make AI work and the overload of AI solutions on the market. The study highlights that automation of customer-service processes is inevitable for many large companies, but there are multiple challenges and risks that must be considered to make effective decisions about the timing of automation-technology integration.

Table of Contents

Table of Figures

List of Abbreviations

AI	Artificial Intelligence
ANNs	Artificial Neural Networks
API	Application Program Interface
CEO	Chief Executive Officer
EU	European Union
GDPR	General Data Protection Regulation
HR	Human Resources
IS/IT	Information Systems/ Information Technology
Kmh	Kilometres per Hour
Mph	Miles per Hour
U.S.	United States (of America)

1 Introduction

1.1 Context and Background

The automation of routine jobs is occurring, as evidenced in multiple empirical studies. At the same time, customer expectations are changing, and with that requirements for worker competencies are changing (Spermann, 2016). Customer service and customer experience are also being empowered by many great tools, helping to make these experiences as seamless as possible for everyone involved. One of these tools is going to be the integration of artificial intelligence (AI) (Hatter and Nucci, 2018). While many studies have focused on jobs that can be automated over the next 10–20 years (Frey and Osborne, 2013), a growing body of recent research suggests that mainly processes and activities, not occupations will be automated.

Every year since 2015, machine learning was identified by Gartner as one of the top 10 strategic technology trend, and its relevance has not diminished in 2018 (Viveca, 2015; Ann, 2016; Kasey, 2017). More ambitiously, Forrester predicts that 2018 is the year to finally make AI work (Hong et al., 2017). Indeed, our era is marked by rapid technological advancement in automation technology and AI (Manyika et al., 2017). Automation of tasks and activities allows businesses to lift performance by reducing errors and improving quality and speed and enable higher productivity (Manyika, 2017).

Even though technological improvement should be something to look forward to, it raises public concern, since automation means that work currently performed by humans will be performed by machines (Manyika et al., 2017). Thus, people wonder whether automation will ultimately lead to mass unemployment. While few occupations can be fully replaced by automation, almost every job involves processes or tasks suitable for automation. This emphasis on tasks suggests evaluating the possibilities and challenges of automation through an analysis of activities and processes rather than occupations.

Automation will not happen overnight, and its speed will depend on industry, country, competitors, activity, skill, and wage level. It remains uncertain at this point how long the full potential of automation will take to realize or whether people will lose their jobs, but a recent analysis from McKinsey, a global management consulting company, indicates that humans will still be needed in the workforce, will work alongside automation, and will

focus on new tasks. Development like this will bring great advantage to businesses and economies worldwide, and over the next few years, it will change the daily work routines of many workers (Manyika, 2017). According to Gartner Research, by 2020 AI will create more jobs than it will eliminate.
Although expectations are high and the opportunities prevalent, it still appears that there are certain factors that prevent organisations from adopting AI (Ransbotham et al., 2017).

1.2 Research Questions

The paper aims to answer the following research question:

Can any customer-service processes in the information systems (IS) and information technology (IT) industry be improved or automated by AI?

In order to help answer the main research question, the following sub-research questions have been identified:

- Which customer-service processes are already being automated in some IS and IT companies?
- Are there other processes that can be automated?
- What prevents organisations from exploring or investing in automation technology?

1.3 Research Beneficiaries

The primary beneficiaries of this research are expected to be customer-service managers and directors in charge of exploring and integrating AI technology into daily customer-service processes. They can draw upon this study to assess automation's potential applications and to understand better its requirements and expectations; this understanding will allow managers and directors to make more informed decisions. The secondary beneficiaries are expected to be service providers of AI technology for customer-service departments. The research will assist these companies in understanding the challenges that customer-service managers and directors face in integrating AI technology.

1.4 Scope and Boundaries of the Research

The scope of this research is limited to the customer-service departments of international technology companies. The research pursued qualitative methods, and eight interviews were conducted in support of the research. All participants were all at the managerial level and above within their company's customer-service department. The findings of the research form the basis of its recommendations.

1.5 Importance of the Research

Research conducted by McKinsey has found that in 2016 tech giants spent between $20 billion and $30 billion on AI. Although investment is growing exponentially, however, the adoption rates remain low (Columbus, 2017).

An O'Reilly Media survey found that 61% of organizations most frequently picked applications of AI such as machine learning as their company's top data initiatives for 2019. The International Data Corporation (IDC) forecasts that spending on AI technology will grow from $12 billion in 2017 to $57.6 billion by 2021 (Columbus, 2018).

Companies are currently failing in their AI technology implementations because they do not have the necessary data foundations and because they underestimate the effort and resources required to integrate AI automation. According to a recent study, 55% of the companies that stated they would be investing in AI had not yet achieved tangible business results. This finding showcases that AI is not an easily implemented solution, and firms need to invest sufficient resources in correctly planning, implementing, and managing the transition. They will need to redesign their operations model and invest in new roles and processes (Evelson and Goetz, 2017). While most companies have not seen any business results or effects from the application of AI technology, they expect to see the impact of AI technology by 2022 (Ransbotham et al., 2017). However, in sum, a substantive gap remains between companies' ambitions for AI technology and their execution (Sam Ransbotham, 2017).

1.6 Chapter Structure

Chapter 2 critically analyses the literature in relation to the following areas of automation technology:

- Technological concepts
- Limitations of AI
- Customer-service scope, trends, and areas of AI application
- Workforce impact
- Barriers to adoption and challenges
- Ethical challenges
- AI-powered customer-service solutions

Chapter 3 describes the methodological framework of the study. It describes the research approach, strategy, ethical considerations, and limitations of the chosen methods.

Chapter 4 presents the analysis and findings of the data collected during the research. It includes the analysis of the qualitative data and discusses patterns and themes. The chapter concludes with a summary of the key findings.

Chapter 5 answers the research question and presents its key findings. The chapter also discusses the limitations of the research and offers suggestions for further research.

2 Literature Review

2.1 Artificial Intelligence as a Technology Revolution

History attests to past technology revolutions, each feared for its potential to cause mass unemployment. Although AI has been around for a while now, the number and prevalence of AI-powered technologies have grown in recent years, mostly due to the growing use of the internet of things and the amounts of cheap and accessible data that are being produced. The more data is available, the more AI systems can be powered (Brigette, 2017).

2.2 Technical Concepts

The term “artificial intelligence” (AI) was coined in 1955, when John McCarthy wrote his proposal for the 1956 Dartmouth Conference (Brigette, 2017). Hyacinth (2017, The Great Artificial Intelligence Awakening, para. 3) defines AI as

> “a branch of computer science that emphasizes the creation of intelligent machines or programs that think, learn and react like human beings. It is defined as the intelligence exhibited by machines by which it mimics cognitive functions that humans use, while interacting with other humans.”

Two popular applications of AI are machine learning and deep learning. Machine learning uses algorithms to enable computers to learn from data, to predict future events based on knowledge obtained from the past, and to learn automatically to make better predictions and decisions in the future (Anon, 2017). Deep Learning is a set of machine learning algorithms inspired by the structure of the biological brain (Hatter and Nucci, 2018). Maslovskaya (2017, The Definition of Deep Learning, para 2) explains:

> “A deep learning technology is based on artificial neural networks (ANNs). These ANNs constantly receive learning algorithms and continuously growing amounts of data to increase the efficiency of training processes. The larger data volumes are, the more efficient this process is. The training process is called «deep», because, with the time passing, a neural network covers a growing number of levels. The «deeper» this network penetrates, the higher its productivity is.”

The most common applications of AI within the context of customer service can be grouped into the following three categories: natural language processing, dialog management or conversational AI, and speech recognition (Rathinam, 2018).

Taking Liddy’s (2001, Introduction, para. 2) definition, natural language processing “is a theoretically motivated range of computational techniques for analysing and representing naturally occurring texts at one or more levels of linguistic analysis for the purpose of achieving human-like language processing for a range of tasks or applications.” The application of these techniques to the context of customer service means that the computer is able to understand and moreover to interpret customers’ intentions and needs, as a human would. This includes the ability to read “between the lines” and understanding slang (Rathinam, 2018).

Conversational AI started in the chatbot era, which began in 2016 when Facebook announced the launch of a developer-friendly platform allowing users to build chatbots on Facebook messenger. Chatbots are natural-language text interfaces based on predefined rules and flows (Menon, 2017). Again, in the context of customer service, this means that chatbots are mostly suitable for straightforward and simple processes that are repetitive, do not change, and can be predefined, for example for making a reservation. All the possible scenarios the customer could run into and ask about during a reservation request are already known and can be programmed as rules. To cover more complex questions, not always known in advance, requires so-called conversational AI platforms. In additional to the natural language interface, conversational AI platforms offer speech synthesis, natural-language comprehension, and cognitive and machine-learning technologies; they are therefore able to learn as well (Menon, 2017).

Speech recognition describes the ability of a machine or program to recognise the spoken word and convert it into readable text that can be then further analysed (Rathinam, 2018). In the context of customer service, speech recognition could be as simple as the automatic transcription of voice mail from customers.

2.3 Limitations of Artificial Intelligence

Artificial intelligence (AI) presently requires oversight, and it is far from a state in which humans can rely on it. If the situation with which AI is presented differs slightly from the data used to train it, the AI may not be able to deliver results, and in the worst case, it might even mishandle the situation. Artificial intelligence acts perfectly logically, but it is not creative. It cannot predict or handle something that never happened previously; while it learns from past events, it cannot speculate on unexpected events in the way that humans can. An case in which AI went wrong was Microsoft's chatbot "Tay", which learnt to be racist on Twitter. Tay was a machine-learning project whose goal was to research conversational understanding; as people engaged and chatted with Tay on Twitter, it was supposed to get smarter. Within a day, Tay had learnt from the worst on social media, being fed racist, misogynist, and propagandist conversation. Ultimately, this input led Tay to idolise Hitler, claiming the holocaust was made up and calling for genocide. Microsoft was heavily criticised after this event, and people stated that it should have been clear that something like this would happen and that there should have been certain filters or protections in place to prevent this (Price, 2016).

Another recent example for AI gone wrong is how one of Uber's self-driving cars recently hit and consequently killed a pedestrian in Arizona, USA. While the incident is still being investigated at the time of this writing, the facts that known so far are as follows: The incident happened at night, and with a human sitting behind the wheel, the self-driving car had been driving in autonomous mode for almost 20 minutes, at about 40 mph (64 km/h), when the pedestrian was hit while walking a bike across the street. It is now known that the autonomous car recognised the pedestrian about six seconds before the crash, first classifying her as an unknown object, then as a vehicle, and lastly as a bicycle, each time recalculating the expectations for the travel path of the object. About one second before the crash, the vehicle detected that an emergency break was needed to avoid a collision. Uber, however, does not allow emergency manoeuvres and instead relies on the human operator to take over in emergency situations. This design choice is to avoid erratic breaking behaviour when a non-dangerous object like a balloon or a plastic bag appears in front of the vehicle.

This incident offers at least two significant takeaways for current limits of AI-technology applications:

1) AI is not ready or able to replace humans.
2) Humans are not yet skilled at working alongside AI (Marshall and Davies, 2018).

For this thesis, which discusses the application of AI technology in customer service, the example of Microsoft's "Tay" is more relevant, and loss of life is less likely to happen should the AI system make a mistake within a customer-service environment. However, the two examples together highlight that constant supervision is needed and that customer-service agents need to be well trained on how to work alongside AI to complement AI applications.

According to John Launchbury, director of the Information Innovation Office at the Defense Advanced Research Projects Agency (DARPA), AI has appeared in three waves:

1) Handcrafted knowledge
2) Statistical learning
3) Contextual adaption

Furthermore, intelligence is classed into the following four categories:

1) The ability to apprehend complex information
2) The ability to learn within an environment
3) The ability to abstract and create new meanings
4) The ability to reason, to plan, and to decide

Within the first wave, experts take existing knowledge about a particular subject area and formulate rules that can be programmed into a computer, for example to have AI play games such as chess or complete scheduling tasks. First-wave AI systems are good at dealing with known situations and facts, but their learning abilities are limited, and they cannot take knowledge and apply it at different levels. That being said, first-wave AI systems remain relevant today and are not outdated.
Second-wave AI technology is closer to the current mainstream conception of AI systems, marked by an ability to learn from statistics. Common areas of application include voice and face recognition. Second-wave systems are good at learning and at understanding the environment, for example distinguishing one face from another. They can also adapt knowledge to different types of situations. However, they have a limited capability to reason logically, an area in which first-wave systems outperform second-wave systems. Second-wave systems can classify data and even predict certain results or outcomes of tasks, but they do not understand context (e.g., “Tay” failed to understand how to apply the knowledge it gathered). This deficiency necessitates third-wave AI, which will concern contextual adaption. Systems need to understand why they are making decisions (Launchbury, 2017).

2.4 Key Customer Service Expectations and Trends for 2018 and beyond

Salesforce (2018, The definition of customer service, para. 1), a leading customer-service provider, offers a definition of customer service:

> “Customer service is the support you offer your customers—both before and after they buy and use your products or services—that helps them have an easy and enjoyable experience with you. Offering amazing customer service is important if you want to retain customers and grow your business. Today’s customer service goes far beyond the traditional telephone support agent. It’s available via email, web, text message, and social media. Many companies also provide self-service support, so customers can find their own answers at any time day or night.

> Customer support is more than just providing answers; it's an important part of the promise your brand makes to its customers."

A recent report revealed that poor customer service results in a loss of more than $75 billion a year for US companies. This number has increased by over $13 billion since 2016, which reinforces that good customer service is of critical importance to businesses and is becoming more important every year (Hyken, 2018). Customers are even willing to pay to receive better customer-service experience. Many companies nowadays are selling "white-glove" service as an add-on to their products. The customer-service department is the "face" of the company, and bad customer-service experiences can result in customers leaving (Salesforce, 2018).

Expectations towards companies delivering customer service have been changing as new technologies emerge. Customers expect to be able to use their contact channel of preference (omni-channel customer service), whether Twitter, WhatsApp, Facebook, phone, or email. In consequence, the company customers are trying to get in touch with has to support their preferred channels. Customer-service agents must to be knowledgeable, empowered, and experienced to be able to solve any problem presented (Haughey, 2017).

Customers also demand personalisation when dealing with their requests. As such, if companies and customer-service agents are able to understand and know customers' preferences, previous requests, and related data, and if companies can apply that context to each new request, they can create personalised and unique experiences for each customer and better anticipate customer needs.

Some of the top challenges for customer experience include organisational culture, organisational structure, and processes—all of which are driven directly by the CEO. Organisational change starts from the top and filters downwards. Therefore, if organisations want to get better at customer service, they need a CEO heavily involved in the customer-service strategy (Morgan, 2017).

Customers also tend to compare different customer-service expectations; they know what a good experience looks like and expect great experiences every time they contact a company.

In addition, self-service options are becoming increasingly popular, where a customer can find the answer to their questions easily themselves on a company's website without having to pick up the phone or write an email (Hyken, 2017).

Finally, customers also expect to get answers as quickly and efficiently as possible, ideally in real time. Understanding that a customer's time is valuable is one of the most important actions a company can take to provide great customer-service experience (Sullivan, 2017).

2.5 Artificial Intelligence Applications for Customer Service

Within the customer-service environment are four main areas of AI application:

1) *Customer deflection:* Keeping the customer-service agent out of the interaction with a customer
2) *Bots:* Simulating customer-service agents engaging in a conversation with customers to solve problems
3) *Workflow-oriented automation and processing:* Routing incoming customer requests and tagging incoming tickets which can be used for automated routing and analytics
4) *Coaching:* Advising agents to help them do their jobs better, for example suggesting steps or replies to the service agent to help a customer through a problem (Hatter and Nucci, 2018)

The two most popular application areas by which AI is currently empowering customer-service agents are AI-powered bots and AI-assisted customer-service agents. Bots communicate independently with customers, while AI-assistance for customer-service agents merely supports agents by offering intelligent suggestions based on the available context. In the latter case, a human customer-service agent still makes the calls and decides whether or not to follow the AI suggestions, further personalizing or modifying the suggestions. The AI on the other hand will use machine learning to learn from this modification and use it to make better suggestions in the future (Nicereply, 2017).

Several examples can be found of how companies are already applying AI to improve customer-service experiences. China Merchant bank is using the WeChat front-end bot handling 1.5 to 2 million customer interactions on a daily basis. Such a volume would

typically require thousands of customer-service agents. However, most questions are simple billing-related questions, for which the interactions can be automated because they are repetitive and because the billing data is readily available to query. Furthermore, these queries can be answered by bots faster than they could be answered by humans. Using a chatbot in this case is the most cost-efficient solution in this scenario.

KLM, a national airline company in the Netherlands, uses AI assistance for their customer-service agents when these agents answer customer requests via Facebook Messenger. With the help of DigitalGenius, KLM has reduced the average waiting period required before customers' issues are addressed. Currently KLM can resolve 30% of customer requests using AI technology (Zhou, 2017).

Another example, DigitalGenius integrates with popular customer-service systems like Salesforce and Zendesk to predict case meta-data and suggest answers based on the case context of the human customer-service representative. It adapts the response to the channel, keeping Twitter replies short (within the 280-character limit) and elaborating in email replies. It allows agents to generate a personalised reply each time, and they save time by not having to search through documentation. Furthermore, the customer-service agent can edit the suggestion, and this in return improves the automated suggestions over time (DigitalGenius, 2018).

As a final example, a major US bank reported that although they have been collecting large amounts of customer data, they have not been able to get actionable takeaways because their data points have been disconnected. With the help of Salesforce.com's Einstein AI or machine learning technology, this bank was able to connect isolated datasets and increase engagement across various business units. Now, for example, if a customer is on their website looking for help concerning mortgage loans but does not contact the company after the search, the next time the customer visits a branch, one of the service agents can follow up and check whether they found everything they were looking for, offering assistance if needed. The software can also identify patterns and suggest to the service agent the best time to call a prospective client, depending on the industry the client is working in, which influences the appropriate time to pick up the phone. Einstein can also schedule a meeting and put a reminder into the service agent's calendar to call a specific client.

Software such as Einstein helps obtain a 360-degree or single view of a customer to be able to suggest the relevant help whenever needed and stay a step ahead, moving away from reactive customer service and tapping into proactive customer service where the customer's needs can be anticipated before they get in touch with a company to ask for help (Boulton, 2018).

Other AI applications used in customer service include voice-recognition technology which can be used to verify the identity of customers on the phone. Customers mostly welcome this experience because they appreciate the quicker service, if they trust the company to not misuse the data. Another use case for voice-recognition technology is to recognise a customer's frustration levels when on a call with call centre agents. This analysis is made possible using real-time sentiment analysis of voice data (Ransbotham et al., 2017).

2.6 Workforce Impact and Employment Shift

Many factors determine the potential impact of automation on the workforce. Amongst these influencing factors are country, sector, and wage. Physical repetitive tasks, such as preparing fast food, are more likely to be automated. Data collection and processing can also be done more efficiently by machines, which may affect occupations like paralegal work or accounting. On the other hand, if human interaction and management of people are involved, automation is not expected to be deeply integrated because this type of task cannot easily be performed by machines (Manyika, 2017; Manyika et al., 2017). With that said, there may be scenarios in which family physicians are replaced by AI physicians. Having access to the most current knowledge of the medical world, knowing the patient's medical history, and being probability experts makes AI physicians attractive (Wammes, 2016).

Other manual occupations in less predictable environments, such as gardening, plumbing, child- or elder-care, will be less impacted by automation because they would be difficult to automate, and at the same time such workers are paid low wages, which makes the business case for automation poor. The number of workers that may have to switch job categories positively correlates with the level of advancement of the respective economy, meaning the more advanced an economy is, the higher the share of workforce needing to learn new skills or switch occupations. In Germany and the US, AI automation could affect up to one-third of the 2030 workforce and in Japan up to half of the workforce. China, a developing country, will face the greatest number of workers needing to switch

occupational categories, however, due to its large population: Up to 100 million people, or 12% of the 2030 workforce may need to transition (Manyika et al., 2017).

Employees will need to acquire and learn new skills over the next few years to adjust the workforce shift. Leaders in IS and IT need to examine the potential effect AI technology may have on their industries and determine how machines and people can work alongside one another to yield maximum advantage for their organisations from the implementation of AI and help workers do their jobs more effectively (Ransbotham et al., 2017, Srivastava, 2017).

Zammuto (2018) suggests that there will be most likely some resistance from some of the affected worforce regardless, and therefore recommends organisation leaders to partner with HR on effective communication and transitioning employees into different roles. He also suggests considering some of the economic benefits resulting from the introduction of automation technology for staffing costs, reinvesting some of these savings into retraining programs for affected employees. Bell (2018) recommends keeping staff informed about any AI initiatives. Usually, people are more receptive to change if they understand the exact implications of the change ahead of time. In addition, various media outlets have poorly communicated and promoted AI technology effects, which is why chief information officers (CIOs) and other company leaders are encouraged to remain enthusiastic when communicating their vision about integrating AI technology and its benefits to the company (Zammuto, 2018).

Research suggests that substantial workflow changes due to the application of AI, are not expected until at least 2022. More drastic changes are expected only in the longer term, over the next 10–20 years. Even so, participants trust in history, which shows that task automation does not entail equal job loss. Where engineers previously spent much time manually synthesizing data for reports, this task can now be automated, allowing them to spend that time assessing the readily available data pool and using it to improve the business.

The nature of work will be transformed not only by AI, but by technological change more generally. Constant advances in technology require people to become agile and flexible in their career choices, embracing the concept of lifelong learning. Additionally, AI comes with a range of new learning possibilities and tools, such as augmented reality and various forms of e-learning (Ransbotham et al., 2017). It is also important to note that AI will be

responsible not only for job elimination or displacement, but also for new jobs with a focus on creativity and critical thinking (Wammes, 2016).

In a survey by MIT Sloan, School of Management, they identified four categories of AI understanding and adoption among respondents: pioneers, investigators, experimenters, and passives.

1) *Pioneers (19%):* Pioneer organisations have a good understanding of the technology behind AI and have integrated AI into their internal and external processes.
2) *Investigators (32%):* Investigators have a good understanding of AI, but they have not yet integrated AI and are instead observing the market trends.
3) *Experimenters (13%):* Experimenters do not have a good understanding of AI but are integrating it regardless.
4) *Passives (36%):* Passives do not have much understanding of AI and also are not investigating or adopting AI (Ransbotham et al., 2017).

2.7 Barriers to Adoption and Challenges

The following barriers to implementation or adoption of AI technologies have been identified. These barriers may not exclusively affect the application within the customer-service industry and may be relevant also for other industries or areas of application.

2.7.1 Security Concerns

A recent report on the malicious use of AI suggests that, as the use of AI technology becomes more widespread and as AI capabilities become more sophisticated, the use of AI will lead to the “expansion of existing threats, the introduction of new threats and a change to the typical character of threats” (Brundage et al., 2018). Furthermore, researchers warn, the potential misuse of AI should be considered early on in the exploration stage of wanting to integrate AI technology. Particularly, data-poisoning attacks, where false training data is injected to the machine-learning system, causing the learning algorithm to become inaccurate and prone to mistakes instead of becoming better over time, presents a security threat relevant for AI applications in the customer-service environment (Brundage et al., 2018).

2.7.2 Data Privacy Issues

Artificial intelligence technology also has to comply with data-privacy laws which may disallow powerful AI algorithms if they do not comply with data privacy rules. Although it is necessary to have strong data governance practices in place to ensure data privacy, only half of the respondents to the survey by Sloan MIT agree that they have strong data governance in place (Ransbotham et al., 2017).

With the recent General Data Protection Regulation (GDPR) coming into force, this regulation may raise another barrier to the adoption of AI technology (Bartoletti, 2018). To quote article 22 of the EU GDPR, “The data subject shall have the right not to be subject to a decision based solely on automated processing, including profiling, which produces legal effects concerning him or her or similarly significantly affects him or her” (Vollmer, 2018c).

While analysing the full impact of the GDPR on automation technology is outside of the scope of this dissertation, it should still be noted that it may considerably impact the adoption of AI technology for customer-service. According to the GDPR, data shall be collected only if the individual has given consent for the processing of data for a specific purpose or if is necessary for the performance of a contract and if the data being processed is limited to what is necessary (Vollmer, 2018b, Vollmer, 2018a). To draw a simple comparison, while GDPR limits the amount of data processing, AI technology will improve in proportion to the amount of data from which it can learn; thus, there is a contradiction that may have considerable implications for successful AI implementation or that may even prohibit the use of certain technologies, such as deep learning.

Noncompliance with the GDPR could result in fines in excess of 4% of a company’s global revenue, which could mean billions of US dollars for larger corporations (Hyacinth, 2017).

2.7.3 Available Data

Artificial intelligence needs examples to learn from, records of failure, and generally high volumes of data. More importantly, the manner of data organisation is important. Businesses often use a mix of internal and external resources, and they use multiple discrete systems, which produce siloed datasets. To make efficient use of AI for customer service, a single view of each individual customer is needed, which requires integrated datasets that cannot be obtained with discrete databases (Salesforce.com, 2017).

Most AI applications or solutions currently on the market must be trained with company-specific data to become useful. Successful training requires having an IS in place that can pull together the data needed to improve the AI algorithm (Ransbotham et al., 2017).

Some CIOs describe the products and services that AI vendors provide as premature, and amassing the data required for AI technology to learn requires much effort. Outside of the context of AI, organisations would not normally collect and document such vast datasets, meaning that company datasets presently tend to be unsuitably small. These CIOs believe that the effort required to make AI-based services helpful is currently not yet worth the investment (Ransbotham et al., 2017).

2.7.4 Expertise

The technology behind AI is difficult, and companies must have the tools and knowledge in place to use it efficiently and analyse the existing data correctly. The aforementioned siloed datasets and a lack of data scientists make successfully implementing AI difficult. Data scientists are able to model the right questions and decision trees and understand the data context. The rise of AI also means that the demand for data scientists is growing (Avoyan, 2017). Due to data science also being a relatively new field because it has emerged with recent technological advancements, such as Big Data and AI, not enough data scientists are around to supply the demand. The combination of these factors contributes to data science being one of the highest-paid job fields, which in turn poses a further barrier to companies interested in AI implementation to get the data expertise they need (Valchanov, 2017).

2.7.5 Understanding the Technology

The managers of any organisation trying to implement AI technology need to be able to understand basics of AI. They should understand how machine learning works and how it can benefit the organization. They do not need to know every detail of deep learning, but they need to be able to understand how to use analytics and data more effectively to make better decisions and produce better results (Ransbotham et al., 2017).

2.7.6 Uncertainty

Accurate estimates of the time and effort required to implement AI and its value are particularly difficult to determine, and doing so may involve more experimentation and trial-and-error than other digital initiatives. Therefore management should consider a certain amount of uncertainty and factor it into their decision-making, prioritizing, and investment processes (Ransbotham et al., 2017).

2.8 Ethical Challenges for Artificial Intelligence

The ethical challenges of artificial intelligence (AI) have themselves prompted much research, because the rise of AI raises concerns about the power that comes with it. Artificial intelligence experts are urging companies investing in such technology to consider and invest heavily in preventing AI from developing surprising or undesirable behaviour that could harm people.

Many examples of AI applications have shown AI can too easily learn from stereotypes of gender, race, ethnicity, nationality and so on. In addition to the example of Microsoft's chatbot "Tay" (see Section 2.3), a photo service by Google categorized black people as gorillas in 2015. It was also found that a US government application of AI for bail sentencing had the scoring algorithm biased against black people. More development is necessary to make sure that AI does not discriminate on the basis of gender, race, or other social biases.

Ethical questions about which lines should not be crossed in AI research and whether there is a limit to what should be built are becoming increasingly important, but it has also been argued that AI researchers and engineers should not be the only ones involved in that discussion. It is a discussion that concerns every citizen and government. According to many researchers, however, with the largest corporations seeking AI experts and investing heavily in this technology, they have unusual power to make decisions they should not be making (Simonite, 2017b, Simonite, 2017a).

Research also raises an important question as to whether machines or humans should be held responsible for damaging actions, which has sparked debate among scientists and experts. While some argue that AI, or at least robots, should be held liable, others argue that this is an attempt to remove liability from the companies and creators of said machines (Smyth, 2018). Specifically, in the European Parliament Resolution on Civil Law

Rules of Robotics report, the European Commission was recommended to create a legal status for robots:

> "Creating a specific legal status for robots in the long run, so that at least the most sophisticated autonomous robots could be established as having the status of electronic persons responsible for making good any damage they may cause, and possibly applying electronic personality to cases where robots make autonomous decisions or otherwise interact with third parties independently". (Delvaux et al., 2017, para. 59f)

In response, a collective of 156 AI and robotics experts from 14 European countries addressed an open letter to the European Commission, warning that granting legal status to robots is inappropriate from both an ethical and legal perspective (Delvaux et al., 2017, Smyth, 2018).

While some of these ethical considerations may not be as problematic for the customer-service industry and may be more relevant when discussing applications like autonomous weapons or other areas in which human life or rights are endangered by AI choices, it is still a very important topic that companies need to consider when thinking about implementing AI technology for various customer-service processes or tasks.

Also offering chatbots and AI solutions for the customer-service industry, International Business Machines (IBM) recommends transparency when companies use bots instead of humans to provide customer service, urging that customers need to know when they are talking to a bot. Especially in cases where sensitive data is involved, there should always be an option to connect to a human instead. When using customer-facing bots, the needs of the customer should come before the needs of the business, even if it means that the implementation may be slower, with higher-cost implications. The company also points out the importance of preventing chatbot abuse and applying a language filter to prevent chatbots from going rogue (Reddy, 2017).

2.9 Artificial-intelligence-powered Customer Service Solutions

Several companies are currently offering artificial intelligence (AI) solutions for customer service, either as standalone products that can be integrated into a company's existing

customer-service software or as part of their catalogue of products, to make switching and integrating easier. The following companies and AI tools are select examples I encountered in my research.

2.9.1 Solvvy

Solvvy uses machine learning, deep learning and transfer learning to learn from your existing knowledge base, ticket history, and other internal data sources. It can be used across various channels, such as web interfaces, mobile interfaces, or chat. It uses natural language processes to understand customers' questions and reply with solutions immediately. It integrates with the most popular customer-service solutions (Solvvy, 2018).

2.9.2 Answer Bot by Zendesk

Zendesk, as one of the leading customer-service platform providers, is investing in their own AI solution to offer as part of their platform. Zendesk's Answer Bot uses machine learning to answer customers' questions with content from a company's customer-facing help-documentation (created on the Zendesk platform), and it learns through customer and agent feedback about the helpfulness of the suggested documentation.

2.9.3 Einstein by Salesforce

Salesforce, another of the leading providers of customer-service platforms, offers their own AI solution, called "Einstein", which offers a range of features, such as automatic case classification, answer recommendation and predictive close times, enabling the routing, escalating, and prioritising of cases based on the time needed to resolve an issue (Milburn, 2016).

2.9.4 Watson by IBM

Watson enables the integration of AI into business processes either by using IBM's application program interfaces (APIs) and pre-trained AI service solutions or by allowing and supporting the construction of models from scratch to enable a more customized AI experience (IBM, 2017).

2.9.5 Ada

This AI software offers out-of-the-box AI chatbots for customer support that integrates with many popular ticketing platforms.

2.9.6 DigitalGenius

DigitalGenius emphasises the combination of AI working alongside humans, offers answer suggestions to customer-service agents, and integrates with major customer-service platforms (DigitalGenius, 2018).

2.10 Summary

This chapter provided an overview of the literature review conducted. First the technical background of AI was provided. The literature also discussed limitations of AI technology and limitations of AI technology specifically in the context of customer-service processes. The literature also provided a review of the future workforce impact and barriers to adoption in regard to AI technology application. It also discussed ethical challenges and gave an overview of some existing AI powered customer-service software solutions.

3 Methodology

This chapter demonstrates the research philosophies and approaches that were followed during the course of this research project. It provides an overview of the research methods that were adopted and the justification behind each of them. This chapter also includes details on the data collection and data analysis procedures. A section outlining the lessons learnt and details of any ethical considerations arising from the data collection is also included.

3.1 Purpose of the Research

This research aims to investigate the impact that automation technology is going to have specifically in the IS and IT customer-service industry. The research aims to determine whether there are customer-service processes in IS and IT companies suitable for automation. This research also investigates the extent to which automation technology is already being used and to identify potential blockers that are keeping customer-service departments from further exploring or implementing automation technology. The intent of the research is to identify what IS and IT customer-service departments need to be ready for automation technology so that CIOs know what to consider in their IT strategy for the following years.

3.2 Research Process

To discuss and answer the research questions, the “research onion” approach developed by Saunders et al. (2009) was followed as a guideline (see Figure 1). Saunders et al.’ research onion describes the various stages, so-called “layers”, involved in the design of a research methodology by a researcher. The first layer of the onion is the adoption of the research philosophy, followed by the second layer, the research approach. The third layer discusses the research strategies, and the fourth layer, the research choices. The fifth layer examines the time horizons, and the sixth layer addresses the techniques and procedures for data collection and data analysis.

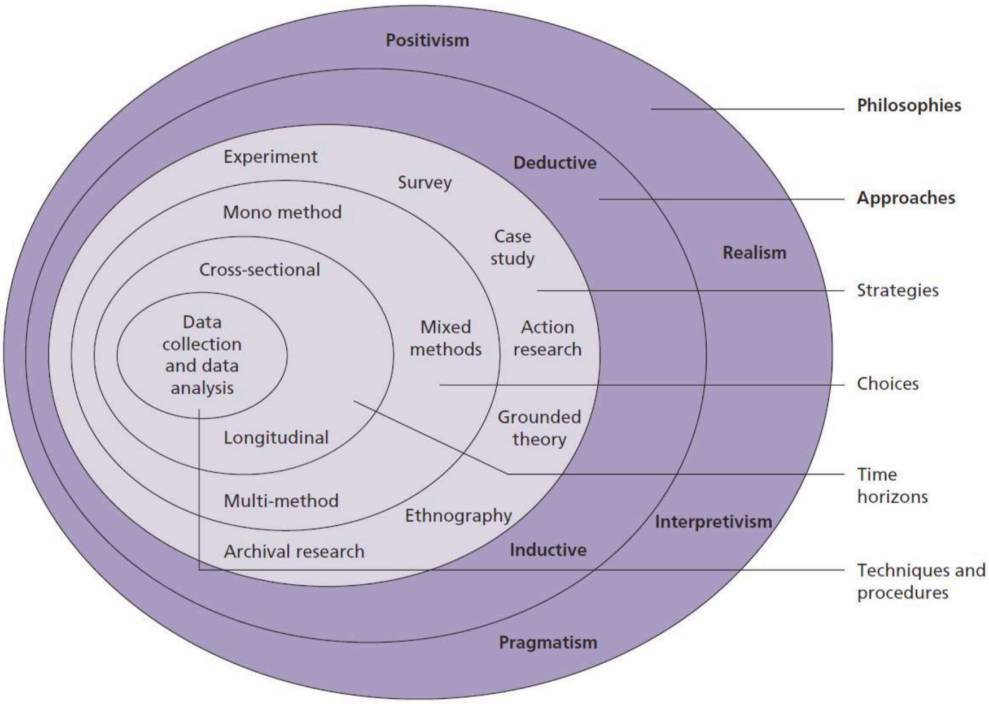

Figure 1: The Research Onion, Saunders et al. (2009)

3.3 Research Philosophy

The research philosophy concerns the way the researcher views the nature of knowledge and therefore influences the approach taken to data collection, analysis, and interpretation. To answer the research questions, the researcher needs to be aware of his or her beliefs and assumptions, which form the foundation for the research strategy (Saunders et al., 2009). There are multiple considerations relevant to research philosophy, but the important ones considered as part of this research can be divided into epistemic and ontological concerns.

3.3.1 Epistemology

Epistemology addresses the researcher's belief system regarding source of the knowledge that guides the research process, and according to Saunders (2009), "what constitutes acceptable knowledge in a field of study". Researchers following quantitative research methods focusing on measuring and counting are categorised as positivists, while researchers using qualitative methods that focus on the description and observation are so-called naturalists. Where positivists assume that there is one measurable truth, naturalists believe that there may be multiple truths, depending on people's interpretations, and that truth cannot be measured in numbers and may frequently change. A naturalistic researcher will focus on the happenings and phenomena relating to specific circumstances and care less about trying to develop rules to be able to apply the findings in a way that can predict the future, as a positivistic researcher would aim to do (Rubin and Rubin, 2012). Furthermore, the positivist conducts research in a "value-free" way, whereas the naturalist may display feelings during the course of an interview that may also influence the respondent (Saunders et al., 2009).

3.3.2 Ontology

Ontology evolves around the nature of reality and the different views of reality formed by the researchers' experience. Two main ontological perspectives can be considered: objectivism and subjectivism (Saunders et al., 2009). According to Bryman (2012), objectivism "is an ontological position that asserts that social phenomena and their meanings have an existence that is independent of social actors". Subjectivism, also known as constructivism, on the other hand, argues that social phenomena are a direct

result of perceptions and the subsequent actions of the social actors concerned with their existence (Saunders et al., 2009).

3.4 Research Approach

In general, two research approaches can be pursued as part of the research design. The first is the deductive approach, in which the researcher develops a theory and hypothesis and subsequently and systematically goes through several stages of analysis to confirm that theory and test implications (Saunders et al., 2009, Rubin and Rubin, 2012). These stages usually include developing a hypothesis from a theory, coming up with measures to test the hypotheses, testing the hypothesis through data collection, examining the outcome, and if necessary, modifying the theory based on findings. On the other hand, if the researcher follows an inductive approach, he or she will start with a stage of exploration, reviewing and gathering data, and will then develop theory based on that data; finally, the researcher relates the resulting theory to the initial literature review. Some important characteristics of the deductive approach are as follows: the desire to explain the relationship between variables, the use of a highly structured methodology to enable easy replication, the application of controls to ensure the validity of the data, the operationalisation of concepts to allow quantitative measurement, the independence of the researcher from the research topic, and the ability to generalise conclusions by selecting population samples of sufficient numerical size.

The inductive approach is characterised by the desire to better understand the nature of an event, the production of an in-depth understanding of the research topic and context, the collection of qualitative data, a flexible research structure, the acknowledgement that the researcher is part of the research process, and a lack of concern for the need to generalise the conclusions. In contrast to the deductive approach, the deductive approach has the theory follow data collection. Inductive researchers often criticise the deductive research approach because it draws conclusions without considering the context of events and the limitations of alterative explanations of an issue, due to the strict framework being used (Saunders et al., 2009).

3.5 Research Strategy

Various research strategies are available. Some of them are more suitable for the deductive approach and others are better suited to the inductive approach. Research strategies can also be combined. The following research strategies have been considered: experiment, survey, case study, action research, grounded theory, ethnography, and archival research.

Figure 2 presents an overview of the available research strategies to consider. For this research, the lower, second half of the figure illustrates the strategy and beliefs followed: constructivism, interpretivism, also known as naturalism, inductive, and qualitative.

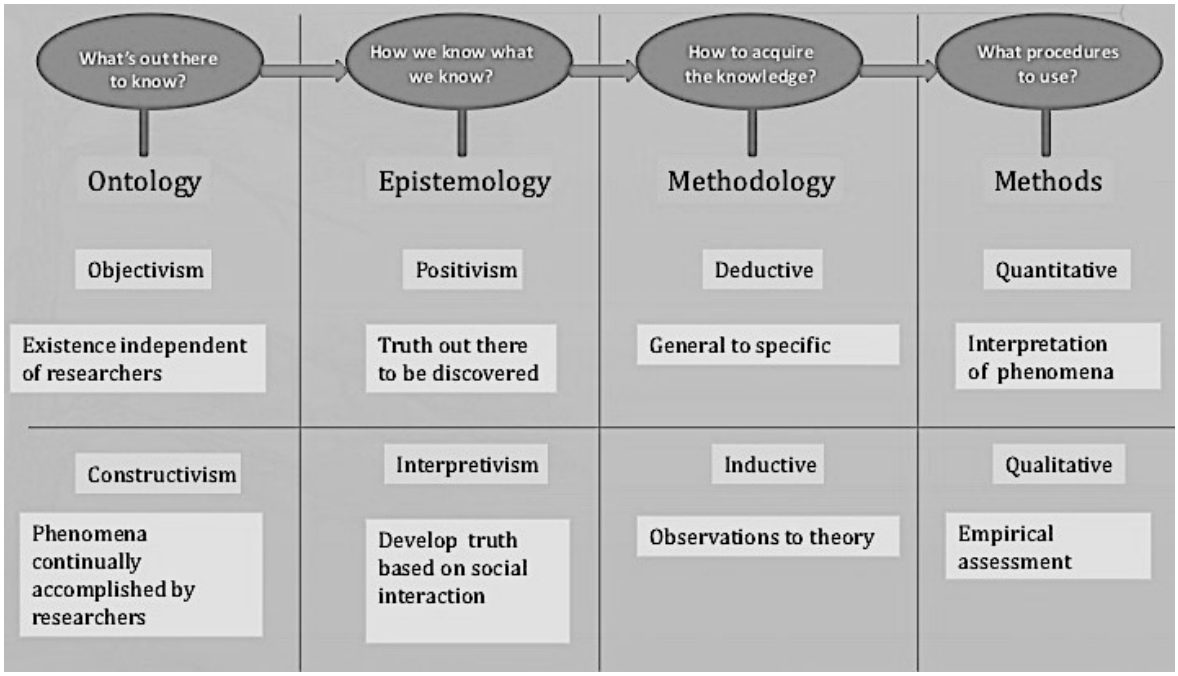

Figure 2: Research Strategy, Yeong (2011)

3.6 Data Collection

The data-collection technique to be used depends on the research question being investigated (Rubin and Rubin, 2012). For this particular research, which is quite unique in nature and focuses on exploring the opinions, habits, and practices surrounding the research topic, semi-structured interviews were identified as the most appropriate data gathering tool. Semi-structured interviews are designed to gather everyday perspectives and insights from the interviewees, and this interview style allows the interpretation of the

conversations had with research participants. The interviews are deemed semi-structured because the interview questions are presented with the same structure in each interview, but the answers are given in an open conversation as opposed to closed questionnaire. This also means that there is a certain openness to the sequence of questions, depending on the progression of the interview. The interviewer seeks to interpret both the denotative answers of interviewees as well as the connotations of what they say, and to do so the interviewer observes the interviewees' body language, tone, and facial expressions to better interpret the meaning of the experiences and opinions they report.

Interviews do not aim to quantify a meaning; instead, they focus on the qualitative knowledge that can be gathered through words. While the interview questions are prepared, the interviewer keeps an open mind with regard to the interpretation, instead of relying on prepared categories of interpretation.

Interviewees may also change their opinions or descriptions over the course of an interview. The interpersonal situation between the interviewer and interviewee is relevant to the data because, depending on the relationship and dynamic between two people, knowledge may be produced that will differ from the knowledge a different interviewer would produce. An interview should also be a positive experience for the subject about a topic in which he or she is interested. The subject may gather new insights and be challenged to question certain opinions or phenomena. Curiosity and sensitivity are important characteristics that the interviewer must exhibit to conduct qualitative interviews (Kvale, 2008).

3.7 Justification for the Approaches and Methods chosen

While various applications of AI technology and AI in general are popular research topics, research is lacking specifically in relation to the application of AI technology within the customer-service departments of technology companies. This research was undertaken to identify the opinions and experiences of customer-service managers within the IS and IT industry with respect to the application of AI technology and the automation of certain customer-service processes and tasks. A variety of research approaches have been considered; however, due to the lack of available literature on the topic, I determined it was not practical to define a theoretical framework and hypotheses beforehand, which

made it very clear that an inductive approach was needed, where data collection could lead, upon analysis, to theory.

Related to my research topic, if I wanted to comprehensively determine the reasons why IS and IT customer-service departments are or are not using AI technology to automate their processes, a deductive approach may have been more suitable, but the available literature wasn't sufficient to suggest that the majority of customer-service departments are or are not using AI technology already. I therefore decided to follow an inductive research approach to gather data and identify patterns on what is happening and why is it happening.
I also considered combining approaches, starting with an inductive approach to generate theory and hypotheses that I could then subsequently test for validity using a deductive approach. However, in this case, because the questions for the questionnaire would be a result of the qualitative data collection and subsequent theory development, it would require two separate applications for ethical approval over the course of the research. As one application takes several weeks to complete and get approved by the research ethics committee, and as data collection could not commence before ethics approval, time constraints on the research barred the possibility of going through the process twice.

3.8 Ethical Considerations

Ethical issues regarding anonymity, confidentially, credibility, corporate knowledge, data storage, and privacy were considered at each stage of the research. Ethics approval was required and sought before any research involving human participants. The application for ethical approval was submitted to the TCD School of Computer Science and Statistics on February 7, 2018, and after minor amendments to the proposed methods, approval to carry out the research was received March 16, 2018. The application included a project outline, information about how participants were to be recruited, the inclusion or exclusion criteria for participants, a list of ethical considerations, how these considerations would be addressed, and a copy of the interview questions.

3.9 Limitations

The limitations of an inductive research approach include the possibility that no pattern will emerge from the research, which could be determined only at the end of the research.

Additionally, it can be more difficult to find participants for the research because interviews take much more time to complete questionnaires. Furthermore, people may be more familiar with surveys and therefore have less faith in the interview approach, which could lead to less willingness to participate. The inductive approach is also generally more time-consuming during both the data-collection and analysis stages (Saunders et al., 2009).

3.10 Research Tool chosen

The qualitative analysis was performed with the help of MAXQDA, a software tool designed for qualitative data analysis, which allows the importing of interview transcripts and audio files and enables analysis and visualisation of data. I selected this specific tool because after evaluating several qualitative data-analytic tools, I determined that MAXQDA seemed to have the most intuitive interface navigation and allowed easy management of codes to break down and analyse data. The software provider also offered a free trial, which was sufficient for the purposes of my research.

3.11 Lessons learnt

Initially, a test interview was conducted to decide whether the question sequence made sense and to further evaluate how long the interview would take and whether any questions needed revision. This test was helpful because it surfaced that the interview length exceeded estimates and that some questions were repetitive. As a result, some of the questions were reordered, and some were removed completely.

When I solicited for volunteers within my profession, the description used for the inclusion criteria was misunderstood by at least one person, which meant the interview had to be immediately aborted because the person could not answer my questions. The interviewee did not fit the description I had meant to indicate and therefore did not have the knowledge to answer my very specific questions.

Seven out of the eight interviews were conducted via video conferencing, and as a result of this medium, one interview was disrupted by a bad internet connection. The result was that this participant’s replies were much shorter and more concise than those of other interviewees.

As mentioned earlier, because interviews are time consuming, it was difficult to find a large number of participants. Additionally, as I was interested in the practices, experiences, and opinions of different organisations, extra effort was required because I was conscientiously recruiting different participants from different organisations. For this reason, I could not simply use my direct professional connections and instead relied upon recommendations and word of mouth from these direct connections. It may have been easier to find participants if I did not limit my sample to one participant per organisation, but then the data would not have been as valuable in the analysis of patterns, since the patterns found may then have been company-specific or, at least, biased by the prevalence of certain patterns in one organisation or another.

4 Findings and Analysis

4.1 Introduction

This chapter's primary purpose is to present the research data collected. The data was collected using semi-structured interviews. The interview template consisted of 32 questions, but depending on the interview the sequence of questions or the number of questions could deviated slightly.

4.2 Background and Context

In support of the research, 10 interviews were scheduled, of which 8 were completed. One participant did not show up to the interview, and we did not manage to reschedule the interview in time for this research. Another interview was cancelled shortly after it began because the participant did not fit the eligibility requirements. Consequently, a total of eight semi-structured interviews occurred with customer-service professionals at the management level or above, each from a different company offering products or services in the IS and IT industry. Each interview lasted between 25 and 45 minutes in length. Seven of the eight interviews were held over video conferencing, and one interview was held in person.

4.3 Interview Analysis and Findings

The participants' identities will remain anonymous, and any identifying information will not be disclosed. I refer to the participants by letter: A, B, C, D, E, F, G or H.

The following section presents a brief overview of each participant's role in the company, the company size, the size of the customer-service departments, and the amount of customer requests these teams field. In cases where the job title may have been identifying because of its uniqueness, I've simplified it.

Participant ID	Job Role	Company Size
Participant A	Senior director	501–1000
Participant B	Senior operations manager	1001–5000
Participant C	Director	11–50
Participant D	Senior operations manager	201–500
Participant E	Senior director	201–500
Participant F	Manager	51–200
Participant G	Chief executive officer	51–200
Participant H	Senior manager	51–200

Figure 3: Participants' Overview

The number of customer-service agents within the various customer-service departments of the participants' respective companies would in most cases lie between five and 42 employees, as shown in Figure 4. Notably, Participant B's company employs 220 customer-service agents, but this figure is significantly higher compared to the other figures due to the fact that Participant B's company is the largest of the interviewees' companies (see Figure 4). Furthermore, Figure 5 displays the request volume the departments are dealing with on a monthly basis.

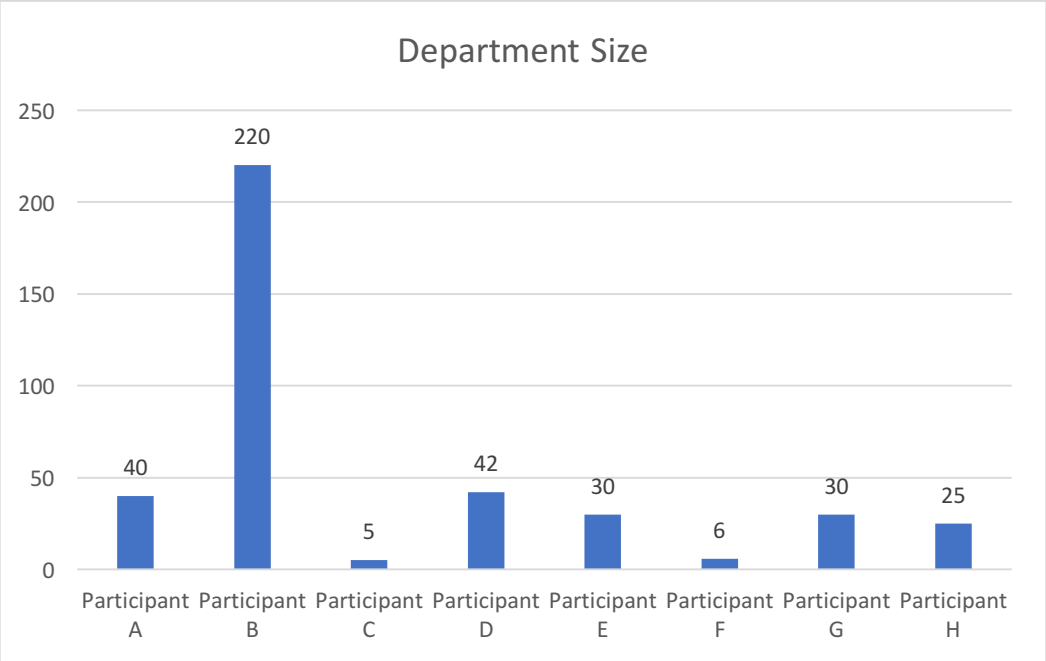

Figure 4: Number of Customer-Service Agents within Department

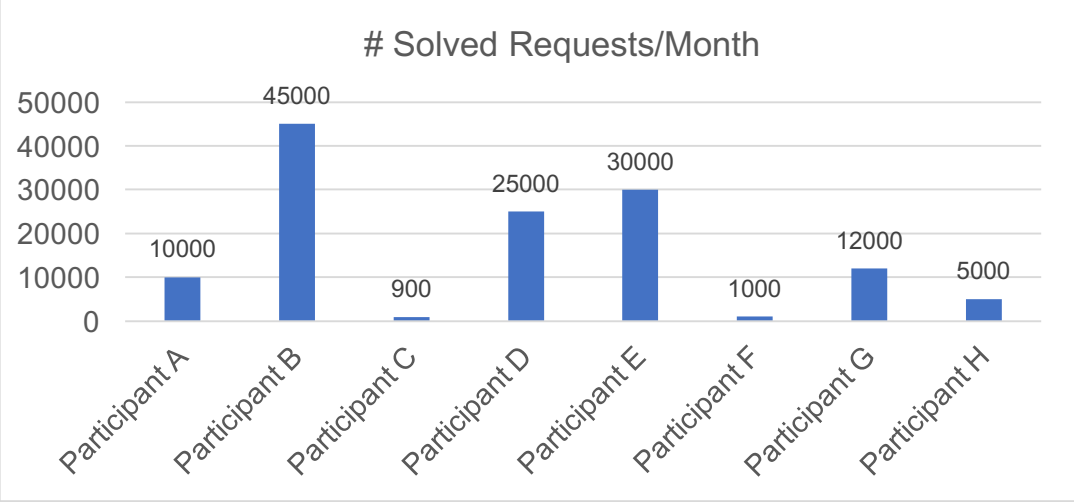

Figure 5: Number of Solved Requests per Month

The participants were asked to share the most important customer-service metrics they track, and the responses are illustrated in Figure 6.

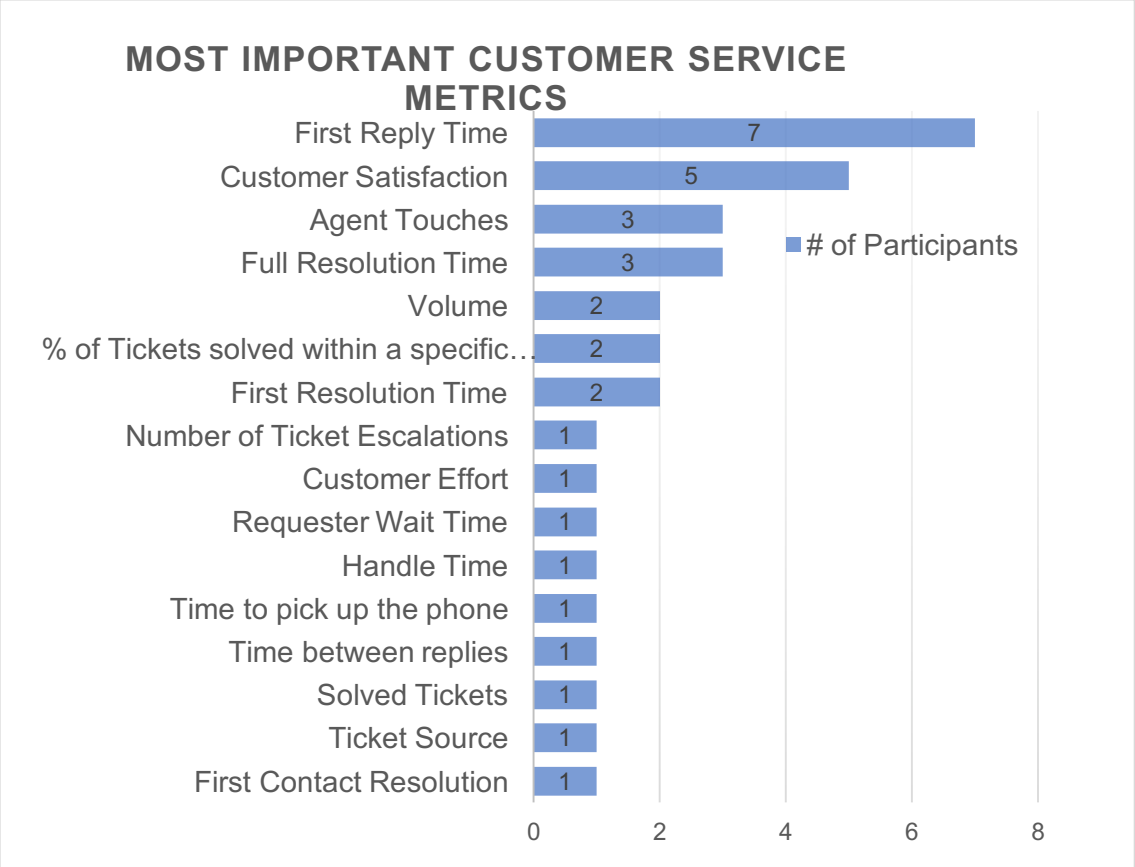

Figure 6: Most important Customer-Service Metrics being tracked

Some of the definitions for the metrics mentioned above are not self-explanatory, and these should be understood as follows:

- *First Reply Time:* The time it takes a customer-service agent (or a chatbot) to reply to an incoming customer request
- *Agent Touches:* The number of replies or back-and-forths (usually email) needed by a customer-service agent to resolve a request
- *Full Resolution Time:* The time taken to fully resolve a customer request
- *First Resolution Time:* The time taken initially resolve a customer request, which may have been re-opened at a later stage—can be identical with full resolution time
- *Customer Effort:* Measures the ease (effort) of an experience with a company to get an issue resolved (Birkett, 2018)
- *Handle Time:* The total time spent resolving a customer request

- *Ticket Source:* The source of the incoming customer request (e.g. email, twitter, chat, etc.)
- *First Contact Resolution:* Requests that the customer-service agents resolve in the first interaction or reply
- *% of Ticket Solves within a Specific Timeframe:* Percentage of requests resolved in two, four, or 24 hours, etc.

4.3.1 Current Automation Status

Only Participant B and E mentioned that they were already using AI technology to automate certain customer-service processes. Participant B specifically named as an example that the company uses AI for foreign-language identification on incoming requests and intelligently routing them to the correct customer-service agent speaking that language. Participant E mentioned the company uses Answer Bot, a AI tool provided by customer-service software provider Zendesk, to send relevant articles to customers after they have submitted requests. From there, the customer can choose whether the article is helpful and has answered the question. If has not helped, the ticket is routed to a human customer-service agent. If it has helped, the ticket is resolved automatically. Participant E mentioned that this method helps the company to reduce ticket volume. The other six participants reported not currently using any AI technology within their customer-service environment. Four of the participants, however, pointed out that they were automating certain tasks within the capabilities of the customer-service tool they were using. These automations, however, are not based on AI technology. I had the impression that the four participants detailing non-AI automation did not understand the difference between AI and non-AI automation very well. Non-AI automation examples named that are currently being used are triggers, macros, the automatic setting of ticket fields for categorisation and tagging, and automatic article suggestions based on keywords. Two participants specifically mentioned that they were currently evaluating Solvvy for AI assisted automation purpose. Another participant mentioned that the company had tried Answer Bot, but it did not work out because the company's public-facing documentation was not qualitative enough for the Answer Bot to suggest suitable articles. Even if a suitable article was suggested, moreover, the quality of the article was not deemed good enough to lead to ticket deflection.

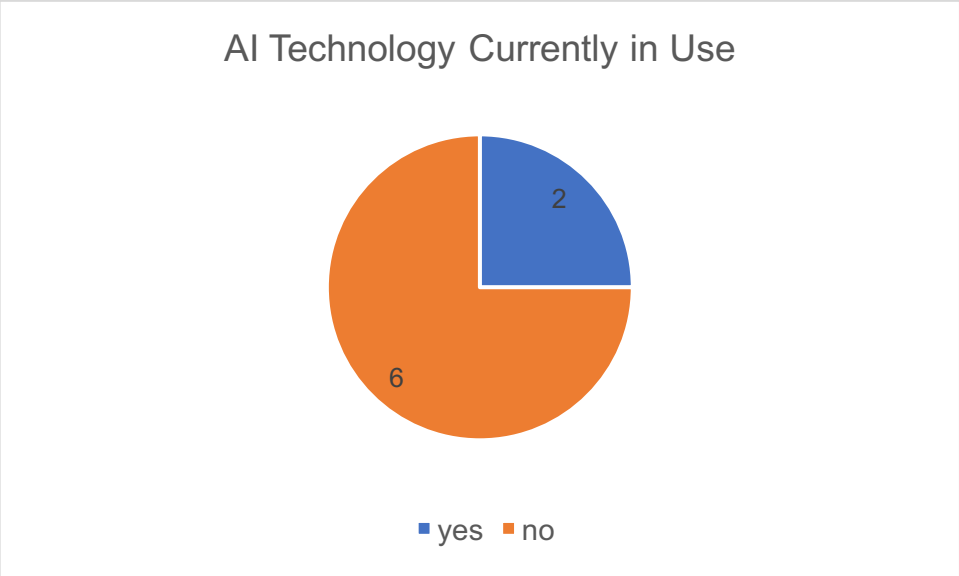

Figure 7: Artificial Intelligence (AI) Technology Usage

4.3.2 Opinions on Future Use

Participants were asked whether they see themselves to be using AI technology as part of their companies' customer-service processes in the future. As expected, based on the previous reply, Participants B and E mentioned that they are always looking at new automation projects and that having AI capabilities built into the current customer-service software helps make that transition easier.

Participant B specifically mentioned: "We always try to automate as much as possible to eliminate the mundane things, tasks."

Participant E stated the following: "As a lot of automation capabilities and AI machine learning start to really evolve within our customer service software itself. We're trying to take advantage of that in addition to doing some of our own. We're seeing our customer service software system actually move towards more automation tools, better workflow management, and that's really helping us, and we're trying to capitalise on it every time those features get released."

Participant D, F and G mentioned they want to start looking into options this year. Participant G also mentioned the following: "I think for us we need to stay incredibly relevant with regards to the changes in our industry and the changes in customer support.

Since we do deal with a lot of repetitive tasks, there is a huge risk for us to be displaced by technology. At least in my opinion."

Participant A and H agreed the use AI technology will become necessary at some point in the future, but they did not want to commit to a certain timeframe.

Participant A left the following remark indicating the above conclusion:

"It really comes down to evaluating the options that are available and seeing if they meet our needs better and also shoring up some of the underlying data… So my intent, at least, is to revisit periodically to see, Are we in a better position? Have the tools evolved? Are they better? And just see if it makes sense, because it's definitely powerful in theory. I'd love to be able to reduce the amount of time we're spending handling basic issues, but at least right now with the testing we've done, it didn't really pan out."

Participant C did not see the use of AI technology on the horizon for their company.

"So I find from what I have seen so far that the technology is still a bit in the early stages and that to really deliver really excellent customer experience for a company like us, which is more a B2B company where we don't have such large volume, we can really manage this better and more carefully still without using AI and machine learning."

4.3.3 Frequency of Process Changes and Complexity of Processes

The research also aimed to discover how often processes are changing at the moment and how repetitive or complex the majority of processes are.
The majority mentioned that major processes usually change every six months, on average, although smaller process changes may occur more frequently.

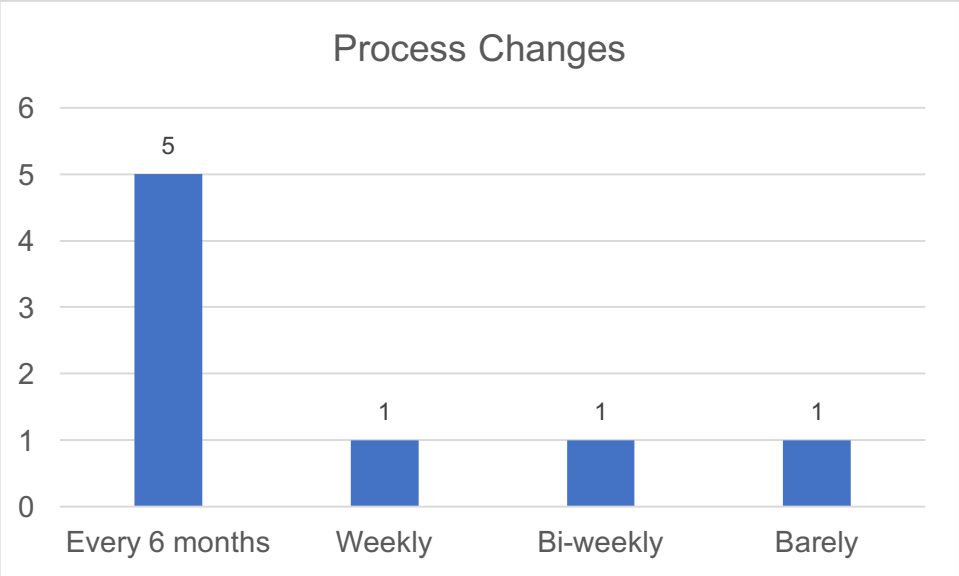

Figure 8: Frequency of Process Changes

The majority also answered that about 20–30% of their organisation's customer-service tasks would be repetitive. Two participants specifically pointed out that repetitiveness would indicate automation potential.

Participant B pointed out the following in regards to repetitive tasks:
"We are trying to keep the repetitiveness as limited as possible because we can see a lot of burn out, boredom that's happening so we don't want to do that; we don't feel that's a real productive use of people's time. And if it's that repetitive, you should be able to automate it."

In regard to complexity, half of the participants were estimating that around 20% of their processes could be characterised as complex, whereas the other half mentioned that 50% or more are complex processes. When asked to define the complexity of a task or process, participants answered that many different systems involved would impact complexity, increasing with more features and integrations from third-party-organisations, whether documentation is available or not. They also noted that customers' history with product usage may also add to complexity.

4.3.4 Documentation

The research further aimed to determine the documentation status of each company, whether they have all of their processes and tasks defined and documented somewhere. However, none of the participants could affirm that their companies have everything

documented. The most confident respondent with regards to documentation was Participant E, one of the current AI technology users; however, Participant E further specified having only about 80–85% potential issues customers could be running into documented, not “everything”. For some of the respondents, it sounded like a significant challenge to maintain their documentation, and others immediately made a connection to AI technology, pointing out that their level of documentation is not where it needs to be to make automation possible.

In regard to documentation status, Participant A stated the following:

“We don’t have every type of issue documented in the sense of what you need to be able to actually do automation. We have the broad strokes processes documented. We have guideposts on a lot of things, but we definitely don't have the level of detail where we would almost need to have every known issue that you're meant to have and their symptoms documented. I feel like we would need to do more to be really able to claim that we've documented every type of issue or every type of process.”

Participant C stated:

“We are looking around for something that is easier to maintain, as we are having so much documentation now of all these different processes and also of documenting different behaviours in the product, and we have a lot of things on there, and it is getting harder to maintain it, so we are in the process now of looking at other solutions where we can work together in a collaborative way more effectively.”

Participant E stated:

“There’s just so many corner cases that by the time you document it, it may never get called to market. It’s a balancing act.”

Participant F, whose customer-service department consists of only six people, openly stated only having about 10% of the possible issues currently documented:

“Yeah,… (laughing) I don’t think anyone is actually very good at it... one of those things where we just had a few guys, and it simply wasn’t a priority. I’d say only 10% is documented at the moment. The rest is just learned on the go. But we are working on it.”

A potential solution to the problem of lack of documentation is practiced by Participant B's team, where customer-service agents will flag and develop missing documentation on the spot.

"We have rolled out a knowledge-centred support program, where we flag the documentation that is not covered under the… what turns out to be the answer or resolution to the customer's ticket. The customer service agent then starts to write up a public facing article as well. To me, what is unique about those is that unlike the usual product documentation that's out there, where it covers the proper way to use our product, our KCS (knowledge centred support) articles are covering unique situations and setups that are not mainstream so to speak. So those are inherently more complex."

Participant D also questioned the need to document "everything":

"We found that like sometimes when you put so many rules, people just get, you know… sometimes there's too many rules trying to keep track of. Sometimes we just don't put a rule on purpose and, you know, get people to use their best judgments. "

4.3.5 Differentiators for the Business

In addition, the research sought to determine the top customer-service goals from the business' perspective. Some of the top goals mentioned were the following:

- The ability to scale more effectively, especially where companies are in hyper growth stages
- Improving the lack of documentation and the quality of existing documentation and having better key wording for better searchability of documentation
- Improvement to the analytic stack being used
- The move from a transactional relationship with customers to a more of a relational relationship in that it is known who customers are and what they need before they even reach out
- The creation of a customer effort score, in order to reduce the effort that customers have to exert to find the answers they are looking for
- Deflection, decreasing ticket volume
- A scale-up of multi-language support

- More quality assurance for ticket reply to ensure customers are getting accurate responses and ideally automate that process

The goal of ticket deflection was specifically raised by half of the participants.

On the other hand, asking participants were asked what they think customers currently expect from them, the following expectations were noted (see Figure 10).

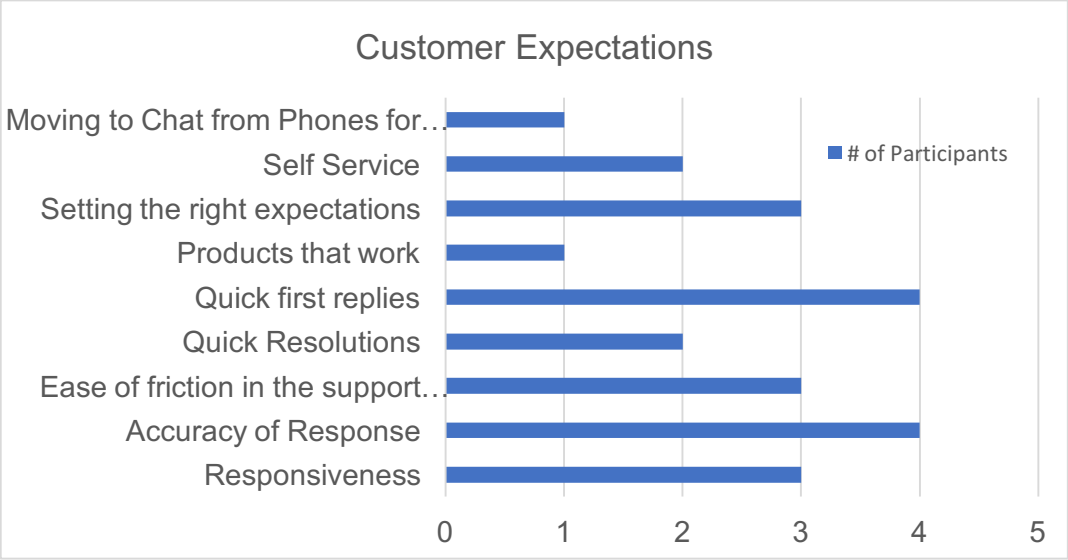

Figure 9: Customer Expectations

Half of the participants agreed that customers expect accurate responses, that nobody wants to be given bad information, and that customers expect to deal with knowledgeable customer-service agents; respondents further suggested that above all, customers want to have the correct answer as quickly as they can get it. Furthermore, although customers want quick first replies, these replies do not always need to come with solutions, although in that case it would be important to set the right expectations for what will happen next and how long the wait time may be to resolve the issue. Customers also expect to have a friction-free support experience and not to have to work hard to find their answers.

Participant A mentioned the following challenge in terms of meeting some of these expectations:

“The hardest part is trying to find ways of doing it without blowing up the amount of staff that we have. We can't scale one to one with our customer growth; we can't hire another

50 agents this year. We need to find of ways of doing it with less without sacrificing quality, without sacrificing responsiveness."

When asked about the importance of real-time replies, the respondents reported mixed feelings. Real-time response may be important from a customer's perspective, but from the business's perspective, it is expensive to offer. It also depends on the nature of the request—whether someone is locked out from their account, needing immediate attention, or whether someone has a more general question that can wait a day. Also, if a question is very complex or technical, it is usually not possible to deal with that question in real time. Participants with smaller teams mentioned that real-time response is not practicable with a small team. Real-time replies or live-chats usually require much "people power" to do well and consistently. This mode of response also becomes difficult when providing phone service, because it is difficult to route a call with complex questions to the right people. People are generally busy, and unless a company can really staff a call centre, it is difficult to ensure that people are available to answer the call all the time. Even then, if they do answer the phone, often agents are unable to provide satisfactory answers on the spot. For this reason, Participant B mentioned that the company is trying to move away from phone support to more text-based solutions.

4.3.6 Artificial Intelligence Technology Knowledge and Awareness

The research also aimed to find out how familiar the respondents were with AI technology, what it means to them in a business context, and potentially any other areas in which they could recall being exposed to artificial intelligence (AI) technology. It seemed to me that all the respondents had a good understanding of where AI technology is currently being used or what it would mean in a business context. One participant went off-topic in answering this question, talking more about automation in a non-intelligent sense, but the overall interview still left the impression that participant knew the difference between intelligent and non-intelligent automation.

Participant B mentioned the following 2 statements:
"A lot of the time there is mundane tasks, and I think that there is a lot of things that automation can help. It's never going to replace every position. It may not replace any position, but one of the indirect things that we are looking at is, well, can you make it a faster resolution?"

“Historically our ticket volume has grown in parallel with our staffing headcount, and if we can impact those touches and have a little bit more automated routing, we can actually start to see that in parallel, where our customer base can continue to grow at a certain growth rate, and our headcount will actually start to decrease that ratio, so to speak. When that happens then we inherently start to have a longer over-time costs saving for your budget as well.”

Participant D thought of the following when being asked about AI technology:
“When I first think of automation, I think of, you know, somebody sends in an email, and then they get an answer, but it is not written by a human. That’s what I first think of it. So that first thought of it is not something that I would like. You know, as a manager of a support team, you wouldn’t like scripted robot responses, but I do see that there is definitely a need for it, so for example something like Solvvy is offering would be great, where it is like they type in their question and are shown an FAQ (frequently asked questions) page to see if it helps them to answer their question, and then if not they are still able to talk to us.”

Participant E came up with the following:
“When I think of automation, it is essentially using bots to chat with people and answer questions. I’ve seen it with a few different other companies who starting to play with it as well, which is, you submit a question and you think you’re talking to a person. Sometimes they intentionally make you know that you’re not talking to a person, so you’ll be talking to some robotic name that they give. And it kind of steps you through your question, and it’s looking for words within your response to keep progress on that workflow until it’s ultimately resolved. I’ve had a few experiences as a consumer even, where it’s great; I actually had fun talking to the bot, more fun than I would talking to humans sometimes. And they often get it right, more often. It’s strange, but it is true. I think that’s the biggest thing for automation, the real-time communications that we can get to, not just automating workflows and processes, I think it’s automating interactions with sort of intelligent bots.”

Participant A mentioned the following:
“As far as examples of that in my day to day life, I don't have a lot of personal examples. I use tools like Alexa or the Echo pretty heavily, but other than that, I don't really deal with services where I see a lot of automation, for the most part.”

The research also aimed to find out whether the respondents' current customer-service tool offers any intelligent automation capabilities and whether they have actively looked into tools offering such functionality. All of the respondents replied that their customer-service tool offers automation functionality.

Figure 10: Customer-Service Software and Artificial Intelligence (AI) Capabilities

In terms of finding other AI technology tools, some of the respondents mentioned that there is an information overflow out there and that it is hard to find the right one. Additionally, testing takes time, and legal and security reviews may be required to evaluate software, which complicates things. Participant D, G and H mentioned that they have attended at least one demonstration of AI technology for customer service.

Participant A pointed out the following:
"I get an email from a company selling automation tools basically every day at this point, and I've lost track of how many different companies have reached out. I usually, always, at least open up their site and poke around a little bit. I haven't done any heavy testing with any of them because it takes time to actually evaluate the tools. A lot of the time you have the data set up on your end in a way that actually makes sense for you to proceed to testing the product, and we added the legal and security reviews to a lot of our acquisition, a lot of our procurement processes, so it's hard for us to actually do that kind of testing in the first place."

Participant B stated the following:

"We've started to look, yeah. There are definitely some that are out there. It's really hard often times to tell the full difference with all of them. They all seem so similar. You hate to say it's a commodity because it probably isn't, but it can be really difficult to distinguish, without trying them, who's is better and who's isn't."

4.3.7 Artificial Intelligence Use-cases

The respondents were asked to identify some use-cases for artificial intelligence (AI) technology integration within a customer service environment. Collectively, the following use-cases were identified:

- Calculate the complexity or the subject or nature of a ticket.
- Calculate a customer health index: how happy is the customer versus how likely are they to quit using the service they are paying for which can then drive the customer experience based on customer health.
- Perform ticket triage.
- Match incoming requests with existing feature requests, known limitations, or bug tickets that are already known, and let the customer know that this is something that is already tracked.
- Track how effective documentation is and how it is being used by customers.
- Deflect repetitive tickets.
- Suggest answers to agents.
- Provide 24/7 availability.
- Create fun experiences for customers.
- Liberate internal resources to work on other initiatives.
- Redirect these human resources to work on proactive customer experiences.
- Speed up resolution of customer requests.
- Provide more seamless experiences.

The respondents also identified the following challenges when considering AI technology implementation:

- The need for good quality data
- Maintenance
- Privacy concerns and customer pushback prompted by the amount of data needed

- Ethical considerations for how companies use the data
- Accuracy of replies and matching the tone and brand of a company
- Organisational resistance (e.g., “But what am I going to do? What is happening to me”)
- Language processing for customers who use dialects or do not speak a language natively or fluently
- Expertise and organisational resources to find the right people to help implement the AI technology
- A balance of buying solutions vs. creating them in-house from scratch

Participant B raised the following point relating to the maintenance and cost implications of AI technology implementation:

“I think that there is a perception out there that once you start using an AI tool, so to speak, or the fact that actually a lot of people confuse machine learning with artificial intelligence. It is two distinctly different things, but a lot of people don’t realise the maintenance that you have to still have to ensure that the tool is tuned and working to its best capability. That’s just a road that if you go down, you now have to financially support it.”

4.3.8 Benefits and Risks

Participants listed the following benefits, which they imagined would be achieved through the integration of AI technology:

- The ability to identify trends and patterns, which is generally difficult for humans to do
- Quicker resolution
- Proper routing
- Lower ticket volume leading to savings on customer-service department’s headcount
- Labour efficiencies
- Higher customer satisfaction

On the other hand, the participants named the following risks:

- AI suggesting the wrong article or reply, which would result in a bad customer experience and the customer losing trust in the company
- Impersonality
- Negative customer reaction if they find out they are dealing with a bot instead of a real person
- Risk to brand and reputation
- Time-consuming setup
- The fact that the technology is yet new and evolving
- Cost implications

Specifically, the concern for how the team will react to a shift to using AI technology was mentioned by several participants. Participant D specifically raised the following concern:

"We currently have these team values, and one of them is 'be humans not robots', so one of the things that might also be a challenge is to get buy-in from everybody on the team that, like, this is the way to go, and no we are not like turning into some faceless corporation and trying to take over your jobs, and we are not trying to be impersonal. There might be that culture shock within the team that people not thinking that it's the right thing to do."

4.3.9 System Complexity and Holistic Customer View

The research further probed how many different systems are involved in capturing customer data, how connected these systems are and, consequently, whether companies have a holistic, integrated view of each customer. Only one of the participants agreed that the company has a holistic view of the customer; all the other respondents said that while it is something they are aiming for, it is not currently the case. There are multiple systems involved to capture customer data, and while support organisations may manage to have one system as the source of truth, they cannot control what other departments, such as marketing or sales, are collecting about the customer; these systems are usually not connected or in communication with each other. The majority of the participants estimated 10 or more independent systems are involved in capturing customers' data. The one participant who did report having a holistic view of each customer mentioned that the company started using certain software called "Gainsight" to centralise all customer information; this interviewee also mentioned that the company is much further ahead than most companies in connecting all of its customer data together.

4.3.10 Dedicated Data Team

Lastly, the research aimed to find out whether the customer-service organisation of each company had a dedicated data team. Three of the participants mentioned they had dedicated data resources, but these would be optimised for data analysts rather than data scientists. While the other five do not have dedicated data resources, they mentioned they could make use of the company's data team, but often that data team does not collect the data that would be relevant to the support organisation, and therefore it is not always as useful.

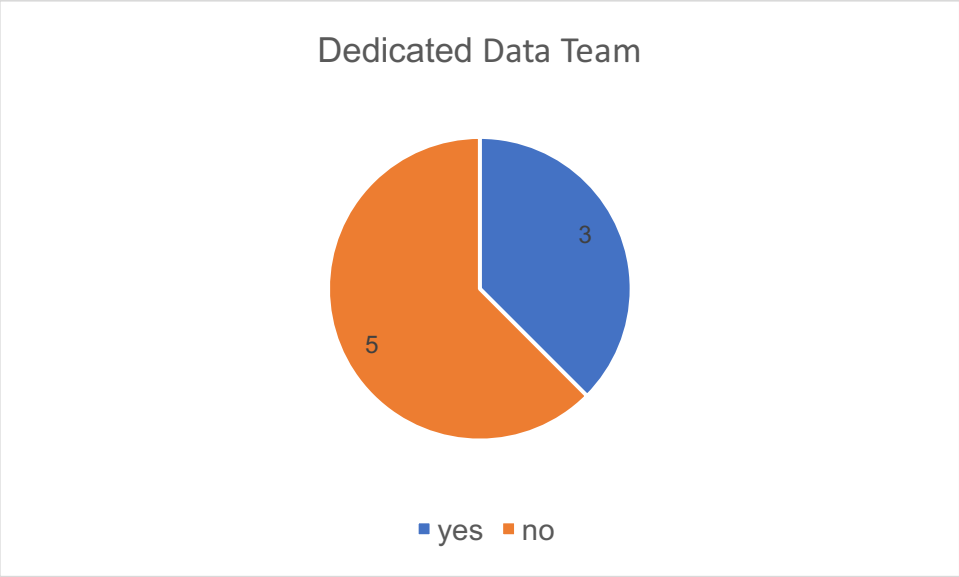

Figure 11: Customer-Service and Dedicated Data Resources

Participant G pointed out that finding data scientists for their purposes is particularly difficult:

"We have a really junior data scientist that just graduated school, but no one that has really strong capabilities to be able to guide us strategically along this journey. But I am realising that it is a really hard find."

5 Conclusions and Future Work

5.1 Introduction

The main purpose of this thesis has been to investigate the impact that intelligent automation technology will have in the customer-service industry. This chapter answers the research question and discuss the identified impact of automation technology in the customer-service industry and present key findings and the conclusion of the research project. The chapter also discusses research limitations and finally, suggestions for further research.

5.2 Answering the Research Question

Can any customer-service processes in the IS and IT industry be improved or automated by AI?

The research has clearly demonstrated that customer-service processes can be improved and automated by the integration of AI technology. Seven of the eight research participants were either already using AI technology for process automation or were considering using it in the near future. All the research participants have shown great interest in the research topic and have agreed that the topic of intelligently automating customer-service processes is timely and relevant to all of them. Within the customer-service environment, four main areas have been identified for AI application: Deflection, chatbots, workflow-oriented automation, and customer-service agent coaching or training. As part of the research, multiple use-cases for the integration of AI technology have been identified. Additionally, several challenges to the integration of AI technology became apparent that keep organisations from further exploring or causing delay to the adoption of AI technology. These challenges are discussed as part of the sub-questions below.

In order to answer this research question, several sub-research questions have been identified and introduced in Section 1.2. The sub-research questions can be answered as follows:

1) Which customer-service processes are already being automated in some IS and IT companies?

The following two customer-service processes are already being automated.

5.2.1 Foreign Language Recognition and subsequent Intelligent Routing and Automatic Resolution

As mentioned by Participant B, the company is using AI technology for foreign language identification of incoming customer requests and then automatically routing them to the correct customer-service agent speaking that language. This work previously had to be performed manually by a human and was also prone to error in the case of requests submitted in languages that look similar (for example Dutch and German). Consequent problems could cause significant delays in the handling of the customer requests.

5.2.2 Resolution of simple Customer Requests without Involvement of Human Customer Service Agents

As mentioned by Participant E, the company is currently using a Bot that will reply to customers submitting a request for help, suggesting relevant help documentation based on the keywords they have been using and from learning based on data from previous requests. The customer can then choose whether the suggestion answered the request and whether help is still needed, and the request will get routed to human customer-service agent. In this scenario, both the customer and the customer-service agent are training the AI by providing feedback about the helpfulness and accuracy of the suggested documentation. This step helps to deflect some of the easy and repetitive customer request volume.

2) Are there other processes that can potentially be automated?

Yes, other processes may be automated as well. As a result of the data collection, the following potential use-cases for intelligent automation have been identified.

5.2.3 Automatic Ticket Routing based on Subject or on the Complexity of a Request

Participants mentioned that the text of a request could be analysed for complexity and, based on that analysis, automatically routed to the right customer-service agent.

5.2.4 Automatic Ticket Routing based on Customer Health

Participants suggested that customer requests could be analysed for customer "happiness" or frustration and prioritize based result.

5.2.5 Matching of Customer Requests to existing Information Resources

For technology companies that track bugs and feature requests, instead of manually linking each customer report to one of the known issues, the process may be automated based on keyword matching to automatically notify the customer, as mentioned by Participant B.

5.2.6 Agent Assistance

The technology may be used to automatically suggest answers to customer-service agents based on how similar requests have been handled in the past and allow the agent to give feedback on the suggestion to train the AI.

5.2.7 Documentation Usage

This method allows a company to track and analyse how effective customer-facing help documentation is and how it is being used by customers.

5.2.8 Chatbots

Chatbots help to provide 24/7 customer-service coverage without extra staffing. They also help to deflect easy and repetitive requests by immediately replying to customers.

3) What is preventing organisations from exploring or investing in automation technology?

5.2.9 Necessary Documentation and Data

One of the biggest challenges to adoption is the documentation and quality data that is needed for automation to be effective. For fast-past technology companies, keeping documentation up-to-date and relevant is a considerable challenge, and for smaller companies, it is simply not a priority because of staffing limitations. Even for larger companies it is impossible to document every scenario a customer might run into and still organise the customer facing documentation in a way that makes it easy for customers to navigate through it.

5.2.10 Maintenance and Cost Implication

One of the participants who is already using AI, particularly, pointed out the maintenance challenge and cost implications that come with integrating AI technology. We are nowhere close to being able to just “plug in and go” with AI technology. The tools need to be constantly trained and reviewed to keep them effective.

5.2.11 Privacy Concerns

The amount of data needed to make automation work also raises privacy concerns. In particular, with GDPR coming into place, which restricts data processing and data collection in order to protect customers’ privacy rights, extensive and uncontrolled access to customers’ data could become a significant barrier to AI adoption.

5.2.12 Expertise

People with the right expertise and data science background are difficult to find but are needed in order to implement and use AI technology correctly.

5.2.13 Organisational Resistance

Some of the participants also mentioned that there may be organisational resistance and that staff may be worried about becoming redundant.

5.2.14 Reputation Damage

There is concern about what happens if AI “goes wrong” and handles customer requests incorrectly, which may hurt the business and the brand, with the reputation of the company at stake.

5.2.15 Ethical Considerations

Participants also pointed out that there are ethical challenges that must be considered in regard to usage of customers data. Companies should be transparent when using AI technology instead of human interactions.

5.2.16 Choosing the right Solution and Procurement Processes

Lastly, there is an overload of AI solutions for customer service that have entered the market at the same time, seeming to offer the same services, which makes choosing the right one difficult. Testing these solutions also presents a challenge, because they usually require data to be available and structured in a certain way; consequently, it is often

impossible to try out the service without first dedicating significant time and effort. Additionally, procurement processes and requirements often add an additional barrier to the testing of new software.

5.2 Limitations of the Research

Due to the recency of the research topic, very few peer-reviewed research papers could be used as a reference. Sufficient research has been carried out on AI technology itself, but its application in customer-service organisations is a new research field.

Furthermore, the main focus of the research was to better understand the impact of automation technology in the customer-service industry. Within this field, the research focused on customer-service departments of technology companies specifically.

It should be noted that the research is not representative of every customer-service department. It is also not representative of every technology company; rather includes a sample of key decision makers in the customer-service departments of eight technology companies. Due to this study's small sample size, its results may not be representative of the wider population.

The study sample may be further biased in that prospective interviewees may have been more likely to participate in the study if they were already familiar with AI technology and had considered integrating it, assuming that other potential participants would have felt they did not have enough to contribute to the study.

The results of this study are based on semi-structured interviews, which offer insight into the personal experiences of the participants. Using a different research approach, such as a quantitative approach, could offer greater generalisability and validation of the findings.

Finally, as AI technology is rapidly evolving, so may be the application areas identified and the challenges customer-service companies face. The pace of change of the research topic should thus be considered, as some of the findings or challenges may become obsolete.

5.3 Suggestions for Future Research

As previously mentioned, the application of AI technology in the customer-service industry is a relatively new field of research, and more research, qualitative and quantitative, needs to be done to fully understand the impact of AI. A qualitative study to generalise and validate the findings of this study is suggested. While the findings of this research are specific to customer-service departments of IS and IT companies, further research to should be done investigate whether the findings can be applied to other industries as well. The research also did not limit its sample to a geographical location; future studies may consider limiting their sample to certain geographical areas as certain challenges such as ethical considerations may be vary based on country and culture. One of the topics that became predominantly relevant towards the end of my research was the introduction of the GDPR, which could introduce a significant challenge to any introduction of AI technology. As such, there is great potential for research to better understand the impact of GDPR on AI technology application and, subsequently, to determine its implications for the customer-service industry.

References

ANON. 2017. *What is Machine Learning? A definition* [Online]. Available from: http://www.expertsystem.com/machine-learning-definition/.

AVOYAN, H. 2017. Machine Learning Is Creating A Demand For New Skills.

BARTOLETTI, I. 2018. Machine learning and data privacy.

BELL, T. 2018. The human side of implementing AI | CIO.

BIRKETT, A. 2018. What is Customer Effort Score (CES)? Available from: https://blog.hubspot.com/service/customer-effort-score.

BOULTON, C. 2018. Machine learning examples: An inside look at 6 success stories | CIO.

BRADY, N. 2018. Tension between AI and personal rights a growing problem.

BRIGETTE, H. 2017. *The Future of Leadership: Rise of Automation, Robotics and Artificial Intelligence*.

BRUNDAGE, M., AVIN, S., CLARK, J., TONER, H. & ECKERSLEY, P. 2018. The Malicious Use of Artificial Intelligence.

COLUMBUS, L. 2017. McKinsey's State Of Machine Learning And AI, 2017.

COLUMBUS, L. 2018. Roundup Of Machine Learning Forecasts And Market Estimates, 2018.

DALLMAN, D. 2018. The Future: Scaling Your Customer Service With Artificial Intelligence | Insights | Blog.

DELVAUX, M., MAYER, G. & BONI, M. 2017. Report with recommendations to the Commission on Civil Law Rules on Robotics - A8-0005/2017. *In:* PARLIAMENT, E. (ed.).

DIGITALGENIUS. 2018. *DigitalGenius | AI Platform for Contact Centers | Product Features* [Online]. DigitalGeniusAI. Available from: https://www.digitalgenius.com/product/.

EVELSON, B. & GOETZ, M. 2017. Predictions 2018: AI Hard Fact – Treat It Like A Plug-And-Play Panacea and Fail.

HATTER, S. & NUCCI, R. 2018. Webinar: How AI Can Give Your Support Team White Gloves, Not Pink Slips. Guru HQ.

HAUGHEY, P. 2017. 7 Key Customer Experience Trends for 2018.

HONG, D., BARBER, N., JACOBS, I., BRUNO, J., LEGGETT, K., SCHOELLER, A., POWERS, S., DAWSON, S. & HARRISON, P. 2017. *Predictions 2018: Blended AI Will Disrupt Your Customer Service And Sales Strategy* [Online]. Forrester. Available from: https://www.forrester.com/report/Predictions+2018+Blended+AI+Will+Disrupt+Your+Customer+Service+And+Sales+Strategy/-/E-RES140259?utm_source=forrester_blog&utm_medium=social&utm_campaign=predictions&utm_content=report_hong.

HYACINTH, B. 2017. *The Future of Leadership: Rise of Automation, Robotics and Artificial Intelligence*.

HYKEN, S. 2017. Ten Customer Service And CX Predictions For 2018.

HYKEN, S. 2018. Businesses Lose $75 Billion Due To Poor Customer Service.

IBM 2017. IBM Watson.

ISMAIL, N. 2018. The evolution of artificial intelligence in customer experience.

JAMES MANYIKA, M. C., MEHDI MIREMADI, JACQUES BUGHIN, KATY GEORGE, PAUL WILLMOTT, AND MARTIN DEWHURST 2017. Harnessing automation for a future that works. McKinsey.

KVALE, S. 2008. *Doing Interviews (Qualitative Research Kit)*.

LAUNCHBURY, J. 2017. A DARPA Perspective on Artificial Intelligence.

LIDDY, E. 2001. Natural Language Processing

MANYIKA, J., CHU, M., LUND, S., BUGHIN, J., WOETZEL, J., BATRA, P., KO, R. & SANGHVI, S. 2017. What the future of work will mean for jobs, skills, and wages.

MARSHALL, A. & DAVIES, A. 2018. Uber's Self-Driving Car Saw the Woman It Killed, Report Says.

MASLOVSKAYA, O. 2017. Deep Learning: Definition, Benefits, and Challenges. Available from: https://stfalcon.com/en/blog/post/deep-learning-benefits-and-challenges.

MENON, R. 2017. The Rise Of Conversational AI.

MILBURN, M. 2016. The Future of Customer Service is Here: Introducing Service Cloud Einstein. Available from: https://www.salesforce.com/.

MORGAN, B. 2017. Five Trends Shaping The Future Of Customer Experience In 2018.

NICEREPLY. 2017-07-12 2017. AI and Customer Service: Now. Available from: https://www.nicereply.com/blog/ai-customer-service-now/.

PRICE, R. 2016. Microsoft is deleting its AI chatbot's incredibly racist tweets. 2016-03-24.

RANSBOTHAM, S., KIRON, D., GERBERT, P. & REEVES, M. 2017. Reshaping Business With Artificial Intelligence. MITSloan.

RATHINAM, P. 2018. AI 101: THE BASICS OF AUTOMATION FOR CUSTOMER SUPPORT.

REDDY, T. 2017. The code of ethics for AI and chatbots that every brand should follow - Watson.

RUBIN, H. J. & RUBIN, I. S. 2012. *Qualitative Interviewing*, Sage.

SALESFORCE. 2018. *Overview: What Is Customer Service?* [Online]. Available from: https://www.salesforce.com/products/service-cloud/what-is-customer-service/.

SALESFORCE.COM 2017. AI for CRM: A Field Guide of Everything You Need to Know.

SAM RANSBOTHAM, D. K., PHILIPP GERBERT, MARTIN REEVES 2017. Reshaping Business With Artificial Intelligence. MITSloan.

SAUNDERS, M., LEWIS, P. & THORNHILL, A. 2009. Research Methods for Business Students.

SIMONITE, T. 2017a. AI Experts Want to End 'Black Box' Algorithms in Government.

SIMONITE, T. 2017b. Artificial Intelligence Seeks An Ethical Conscience.

SMYTH, P. 2018. Ethical as well as technological challenges to robotics and AI.

SOLVVY. 2018. *Customer Support Automation with Help Desk Integration* [Online]. Available: https://solvvy.com/product/.

SRIVASTAVA, S. 2017. Game changer or jobs at risk? AI and work of the future | CIO.

SULLIVAN, F. 2017. Top 5 Customer Service Expectations in 2017. Available: https://www.customercontactwest.com/2017/10/12/top-5-customer-service-expectations-2017/.

VALCHANOV, I. 2017. Why Data Science Is Such A Hot Career Right Now.

VOLLMER, N. 2018a. Article 5 EU General Data Protection Regulation (EU-GDPR). SecureDataService.

VOLLMER, N. 2018b. Article 6 EU General Data Protection Regulation (EU-GDPR).

VOLLMER, N. 2018c. Article 22 EU General Data Protection Regulation (EU-GDPR). SecureDataService.

WAMMES, F. 2016. AI, robotics and the future of work | CIO.

WILLCOCKS, A. 2017. AI Is Transforming Customer Service—Here Is How to Use It.

ZAMMUTO, M. 2018. How CIOs can get buy-in for a job-destroying AI revolution | CIO.

ZHOU, A. 2017. How Artificial Intelligence is Transforming Enterprise Customer Service. Available from: https://www.forbes.com/sites/adelynzhou/2017/02/27/how-artificial-intelligence-is-transforming-enterprise-customer-service/.

Appendices

Appendix 1 - Ethics Application and Supporting Documentation

DocuSign Envelope ID: 55637594-7CC5-4D2A-9168-4EFDD711766E

School of Computer Science & Statistics
Research Ethics Application

Part A

Project Title: Potential Impact of automation technology in the IS/IT customer service industry

Name of Lead Researcher (student in case of project work): Jenny Feith

Name of Supervisor: Maria Loomes

TCD E-mail: feithj@tcd.ie Contact Tel No.: 0834648617

Course Name and Code (if applicable): Management of Information Systems (M.Sc.)

Estimated start date of survey/research: 12th February 2018

I confirm that I will (where relevant):

- Familiarize myself with the Data Protection Act and the College Good Research Practice guidelines http://www.tcd.ie/info_compliance/dp/legislation.php;
- Tell participants that any recordings, e.g. audio/video/photographs, will not be identifiable unless prior written permission has been given. I will obtain permission for specific reuse (in papers, talks, etc.)
- Provide participants with an information sheet (or web-page for web-based experiments) that describes the main procedures (a copy of the information sheet must be included with this application)
- Obtain informed consent for participation (a copy of the informed consent form must be included with this application)
- Should the research be observational, ask participants for their consent to be observed
- Tell participants that their participation is voluntary
- Tell participants that they may withdraw at any time and for any reason without penalty
- Give participants the option of omitting questions they do not wish to answer if a questionnaire is used
- Tell participants that their data will be treated with full confidentiality and that, if published, it will not be identified as theirs
- On request, debrief participants at the end of their participation (i.e. give them a brief explanation of the study)
- Verify that participants are 18 years or older and competent to supply consent.
- If the study involves participants viewing video displays then I will verify that they understand that if they or anyone in their family has a history of epilepsy then the participant is proceeding at their own risk
- Declare any potential conflict of interest to participants.
- Inform participants that in the extremely unlikely event that illicit activity is reported to me during the study I will be obliged to report it to appropriate authorities.
- Act in accordance with the information provided (i.e. if I tell participants I will not do something, then I will not do it).

Signed: ..... Date: 14th January 2018
Lead Researcher/student in case of project work

Part B

Please answer the following questions.		***Yes/No***
Has this research application or any application of a similar nature connected to this research project been refused ethical approval by another review committee of the College (or at the institutions of any collaborators)?		No
Will your project involve photographing participants or electronic audio or video recordings?		Yes
Will your project deliberately involve misleading participants in any way?		No
Does this study contain commercially sensitive material?		No
Is there a risk of participants experiencing either physical or psychological distress or discomfort? If yes, give details on a separate sheet and state what you will tell them to do if they should experience any such problems (e.g. who they can contact for help).		No
Does your study involve any of the following?	Children (under 18 years of age)	No
	People with intellectual or communication difficulties	No
	Patients	No

School of Computer Science and Statistics
Research Ethical Application Form

Details of the Research Project Proposal must be submitted as a separate document to include the following information:

1. Title of project
2. Purpose of project including academic rationale
3. Brief description of methods and measurements to be used
4. Participants - recruitment methods, number, age, gender, exclusion/inclusion criteria, including statistical justification for numbers of participants
5. Debriefing arrangements
6. A clear concise statement of the ethical considerations raised by the project and how you intend to deal with them
7. Cite any relevant legislation relevant to the project with the method of compliance e.g. Data Protection Act etc.

Part C

I confirm that the materials I have submitted provided a complete and accurate account of the research I propose to conduct in this context, including my assessment of the ethical ramifications.

Signed: ..... Date: 14th January 2018
Lead Researcher/student in case of project work

There is an obligation on the lead researcher to bring to the attention of the SCSS Research Ethics Committee any issues with ethical implications not clearly covered above.

Part D

If external or other TCD Ethics Committee approval has been received, please complete below.

External/TCD ethical approval has been received and no further ethical approval is required from the School's Research Ethical Committee. I have attached a copy of the external ethical approval for the School's Research Unit.

Signed: ..... Date: .....
Lead Researcher/student in case of project work

Part E

If the research is proposed by an undergraduate or postgraduate student, please have the below section completed.

I confirm, as an academic supervisor of this proposed research that the documents at hand are complete (i.e. each item on the submission checklist is accounted for) and are in a form that is suitable for review by the SCSS Research Ethics Committ

DocuSigned by:
Signed: Maria Loomes Date: 7/2/2018
Supervisor 19543CF3479...

Completed application forms together with supporting documentation should be submitted electronically to the online ethics system - https://webhost.tchpc.tcd.ie/research_ethics/ When your application has been reviewed and approved by the Ethics committee, hardcopies with original signatures should be submitted to the School of Computer Science & Statistics, Room 104, Lloyd Building, Trinity College, Dublin 2

Appendix 2 – Information Sheet for Participants

TRINITY COLLEGE DUBLIN

School of Computer Science and Statistics

INFORMATION SHEET FOR PROSPECTIVE PARTICIPANTS

Research Title: Potential impact of automation technology in the IS/IT customer service industry

Lead Researcher: Jenny Feith - Trinity College Dublin, School of Computer Science and Statistics

Supervisor: Maria Loomes - Trinity College Dublin, School of Computer Science and Statistics

Lead Researcher Contact Details:

Name: Jenny Feith

Phone: +353 (0) 83 4648617

Email: feithj@tcd.ie

Expected Duration: The expected duration of this research is from January to May 2018.

Background:

We live in an era marked by rapid technological advancements in automation technology and artificial intelligence. Automation of tasks and activities allows businesses to improve performance by reducing errors and improving quality and speed and enable higher productivity. Any substantial change or development in the workforce also comes with public concern and therefore researchers have been analyzing the impact automation technology will have on the job market over the next 10 – 15 years.

While only few occupations can be fully replaced by automation, almost every job has some processes or tasks that are suitable for automation. Automation is not going to replace workers but it will complement them so that the workload can be shared and workers will be able to perform new tasks. Development like this will bring great advantage to businesses and economies worldwide and over the next few years it will change the way many of our daily work routines today look like. Depending on the industry, automation technology will have different effects on the occupations and

some jobs will be more affected than others or in other words, some jobs and tasks will be more suitable for automation than others.
Looking at the customer service industry specifically, with the current technology advancements, customer expectations are changing and with that the requirements for customer service processes are changing too. Customers expect faster solutions, omnichannel support, real-time reaction, tracking of the customer journey, proactive customer support, prioritization on a case-by-case basis, personalised experiences and much more. All of this allows a lot of potential but also challenges for automation technology.
The purpose of the research is to enable stakeholders and readers to better understand the impact of automation technology specifically in the IS/IT customer service industry. The research aims to find out if there are customer service processes in IS/IT companies that are suitable for automation. This research will also investigate to what extend automation technology is already being used and identify potential blockers that are keeping customer service departments from further exploring and/or implementing automation technology.

Procedures of this study:
The interview will take approximately 30 minutes of your time. To aid the analysis of this interview and the associated transcription, the interview audio will be recorded and stored on an encrypted laptop. If this causes any concerns you can instead request the interview to be manually transcribed, although this may extend the interview duration. No audio or video recordings will be made available to anyone other than the research team, nor will any such recordings be replayed in any public forum or presentation of the research. You may request to stop electronic recording at any time, and you may at any time, even subsequent to your participation in this research, have such audio recordings destroyed. At no time will any electronic recording be identifiable unless you give prior written permission. The recordings will be destroyed by the 30th of June 2018.

Why and how you were selected for participation:
You've been selected to participate in this research due to your knowledge of and management expertise within the IS/IT customer service industry and

its processes. I've asked friends and work colleagues to recommend suitable participants matching the criteria above and I acknowledge that I am taking advantage of my existing relationships in order to make progress in my research.
Participants who are contacted via email or LinkedIn should know that I have access to their contact details through word of mouth in the case of friends, colleagues and other professional connections.

Declaration of conflicts of interest:
The lead researcher declares that he has no conflicts of interest of any sort in connection with this research. The lead researcher is not aware of any conflicts of interest between any of the research team and this research.

The voluntary nature of the participation:
Your participation in this research is voluntary, and without prejudice to your legal and ethical rights. You have the right to withdraw at any time without penalty. You have the right to omit any responses to individual questions without penalty. If you are being observed, you will be asked for your consent to be observed, and this consent can be withdrawn by you at any time.

Anticipated risks/benefits of participation:
No risks to you have been identified as a result of participating in the interview process. However, please be aware that if you make illicit activities known, these will be reported to appropriate authorities.

The provisions for debriefing after participation:
If requested, you will be fully debriefed at the end of your participation in this research. If you so wish, you will also be given a brief explanation of the study.

Publication and presentation of resulting data and findings:

Results of the interviews supporting the study will be aggregated and reported on an aggregated basis. All results data will be completely anonymous with the identity of the participants never being revealed in any way. All results will be used as part of the dissertation in partial fulfilment of the requirements for the degree of M.Sc. in Management of Information Systems (MIS) being undertaken at Trinity College Dublin. Trinity College Dublin will retain the dissertation upon completion. Research outcomes will be shared directly with Trinity College. Additionally, results, data and findings from this research may be published in one or more peer-reviewed journals, conference proceedings, and a variety of other research publications and conferences. Findings from this research may be used to better understand the impact of automation technology in the IS/IT customer service industry and how to improve the required automation tools and processes to meet demands. By participating in this research, you agree that this data may be used for such scientific purposes, and that you have no objection that the data is published in research and scientific publications in a way that does not reveal your or your company's specific identity.

Preservation of participant and third-party anonymity in analysis

At all times, your data will be treated with full confidentiality. There will be preservation of participant and third-party anonymity in analysis, publication and presentation of resulting data and findings. Any results, data and findings will be fully anonymous and no personal details about you will be revealed or identified as yours. If you name any third parties, these will be anonymized.

Provision for verifying direct quotations and their contextual appropriateness

If any direct quote from you is to be used, you will be contacted in advance and asked to give permission for the use of the quote. You will also be asked if the use of the quote is contextually appropriate and otherwise accurate. If you decline to give permission, the quote will not be used.

The lead researcher must, at all times, act in accordance with all information provided in this and other documents.

Ethical Approval:

The lead researcher has obtained ethical approval for this research from the School of Computer Science and Statistics, Trinity College Dublin.

Appendix 3 – Participant Consent Form

TRINITY COLLEGE DUBLIN
INFORMED CONSENT FORM

Research Title: Potential impact of automation technology in the IS/IT customer service industry

Lead Researcher: Jenny Feith - Trinity College Dublin, School of Computer Science and Statistics

Supervisor: Maria Loomes - Trinity College Dublin, School of Computer Science and Statistics

Background of Research:

We live in an era marked by rapid technological advancements in automation technology and artificial intelligence. Automation of tasks and activities allows businesses to improve performance by reducing errors and improving quality and speed and enable higher productivity. Any substantial change or development in the workforce also comes with public concern and therefore researchers have been analyzing the impact automation technology will have on the job market over the next 10 – 15 years.

While only few occupations can be fully replaced by automation, almost every job has some processes or tasks that are suitable for automation. Automation is not going to replace workers but it will complement them so that the workload can be shared and workers will be able to perform new tasks. Development like this will bring great advantage to businesses and economies worldwide and over the next few years it will change the way many of our daily work routines today look like. Depending on the industry, automation technology will have different effects on the occupations and some jobs will be more affected than others or in other words, some jobs and tasks will be more suitable for automation than others.

Looking at the customer service industry specifically, with the current technology advancements, customer expectations are changing and with that the requirements for

customer service processes are changing too. Customers expect faster solutions, omnichannel support, real-time reaction, tracking of the customer journey, proactive customer support, prioritization on a case-by-case basis, personalized experiences and much more. All of this allows a lot of potential but also challenges for automation technology.

The purpose of the research is to enable stakeholders and readers to better understand the impact of automation technology specifically in the IS/IT customer service industry. The research aims to find out if there are customer service processes in IS/IT companies that are suitable for automation. This research will also investigate to what extend automation technology is already being used and identify potential blockers that are keeping customer service departments from further exploring and/or implementing automation technology.

Expected Duration: The expected duration of this research is from January to May 2018.

Procedures of this study:

As outlined in the previous section, this research will attempt to reveal the impact of automation technology on customer service processes of companies within the IS/IT industry.

These research objectives will be achieved using a variety of research methods including semi-structured interview of a variety of participants. As a researcher and a customer service professional myself, I would like to invite you to participate in this study. Should you agree to participate, your involvement would consist of a 30 minutes interview with the lead researcher. The topics covered in the interview will include, but are not limited to, your understanding of automation technology, processes within your company that may be suitable for automation or may be already automated, identify potential blockers for automation and discuss some of your business goals and how automation may affect them.

All interviews will be recorded electronically.

No audio or video recordings will be made available to anyone other than the research team, nor will any such recordings be replayed in any public forum or presentation of the research. You may request to stop electronic recording at any time, and you may at any time, even subsequent to your participation in this research, have such audio recordings destroyed. At no time will any electronic recording be identifiable unless you give prior written permission. The recordings will be destroyed by the 30th of June 2018.

Your participation in this research is voluntary, and without prejudice to your legal and ethical rights. You have the right to withdraw at any time without penalty. You have the right to omit any responses to individual questions without penalty

No risks to you have been identified as a result of participating in the interview process. However, please be aware that if you make illicit activities known, these will be reported to appropriate authorities.

Publication and presentation of resulting data and findings:

All results will be used as part of the dissertation in partial fulfilment of the requirements for the degree of M.Sc. in Management of Information Systems (MIS) being undertaken at Trinity College Dublin. Trinity College Dublin will retain the dissertation upon completion. Research outcomes will be shared directly with Trinity College. All results data will be completely anonymous with the identity of the participants never being revealed in any way. Additionally, results, data and findings from this research may be published in one or more peer-reviewed journals, conference proceedings, and a variety of other research publications and conferences. Findings from this research may be used to better understand the impact of automation technology in the IS/IT customer service industry and how to improve the required automation tools and processes to meet demands. By participating in this research, you agree that this data may be used for such scientific purposes, and that you have no objection that the data is published in research and scientific publications in a way that does not reveal your or your company's specific identity.

DECLARATION:

- I am 18 years or older and am competent to provide consent.
- I have read, or had read to me, a document providing information about this research and this consent form.
- I have had the opportunity to ask questions and all my questions have been answered to my satisfaction and understand the description of the research that is being provided to me.
- I agree that my data is used for scientific purposes and I have no objection that my data is published in scientific publications in a way that does not reveal my identity.

- I understand that if I make illicit activities known, these will be reported to appropriate authorities.
- I understand that I may stop electronic recordings at any time, and that I may at any time, even subsequent to my participation have such recordings destroyed (except in situations such as above).
- I understand that, subject to the constraints above, no recordings will be replayed in any public forum or made available to any audience other than the current researchers/research team.
- I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.
- I understand that I may refuse to answer any question and that I may withdraw at any time without penalty.
- I understand that my participation is fully anonymous and that no personal details about me will be recorded.
- I have received a copy of this agreement.

PARTICIPANT'S NAME:

PARTICIPANT'S SIGNATURE:

DATE:

Statement of investigator's responsibility: I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

RESEARCHER'S CONTACT DETAILS:

Name: Jenny Feith
Phone: +353 (0) 83 4648617
Email: feithj@tcd.ie

INVESTIGATOR'S SIGNATURE:

DATE:

Appendix 4 – Interview Questions

General information/statistics:

1. How many customer service agents are there/how big is the team?
2. Describe the customer service team structure
3. How many support tickets are your teams handling per month?
4. What is your Customer satisfaction rating target and are you usually reaching it?
5. What is your first response time target and you usually reaching the target?
6. What other important customer service metrics are you tracking?
7. What are your customer service operations hours?
8. If operation hours are not 24/7: Is this something you are aiming for and what is keeping you from it?
9. If operation hours are 24/7: Is it going well? Are there sufficient resources?

Process & Data Analysis:

10. Describe a typical customer service process from start to finish?
11. How/where are you documenting your customer service processes?
12. Have you completely defined and documented each of your processes? And if not, is this something you are working on?
13. How would you define complexity of a customer service task (eg number of tools/systems involved, number of steps included to execute task...)?
14. How many of your processes would you characterise as complex (%)?
15. How many different systems are currently involved to capture customer data and how connected are they?
16. How frequently are you analysing your customers data and use it for business decisions
    - What kind of business decisions
17. Based on customer data, what are the top 3 predictions you have to be able to make (eg hiring forecast, ticket volume...)
18. Do you currently have the statistical models/tools to make such predictions accurately?
19. Do you have any auditing processes in place and if yes how do they look like?
20. Do you have a dedicated Data Team / Data Scientist for your customer service department?
21. If not, are you able to use shared Data team resources or are you looking at getting dedicated resources?
22. How does your organisation purchase/acquire software?
23. Who generally decides to use and/or approves the use of different workflows or processes within the customer service department

Automation:

24. What does automation mean to you and can you name an example where you are seeing automation in your everyday life?
25. Looking back at an earlier question (11), where you described a typical

customer service process – can you now let me know which of the paths or tasks involved could be automated?
26. Are you currently automating any customer service processes and if so, can you name some examples?
27. If not, can you name some blockers or reasons for it?
28. How often do your customer service processes usually change?
29. Name some examples for repetitive/standardised tasks (rules-based and consistent) that customer service agents are doing on a daily basis
    - What is keeping you from automating them
30. How much of your overall workload/tasks would you say is repetitive (%)?
31. Can you tell me about at least one automation project in the last 12 months that has been perceived as a major success or failure and what was your involvement if any?
    - What did you observe as the main driver for success or failure of the project?
32. Are you planning on using (more) automation in the near future (1-2 yrs.)?
33. Does your current customer service management tool offer automation capabilities?
    - If yes what sort of capabilities?
34. Have you looked into other solutions / Are you aware of specific solutions for automation technology that could be beneficial to your company?
35. What positive outcomes/advantages come to your mind when you think about automation of more tasks
36. What negative outcomes come to your mind when you think about automation of more tasks
37. Can you think of other processes in the company outside of the customer service department/processes that are being automated?

Business goals:

38. What are your current top goals/objectives for the customer service organisation?
39. Do you have current goals in regard to deflection of tickets or calls and if so, describe how they look like?
40. Name the top 3-5 customers service expectations from the customers perspective and do they have an impact on customer satisfaction ratings?
41. What are you doing to meet these expectations?
42. How is the CEO involved in your customer service strategy, if at all?