Service Robots in the Automobile Salesperson Profession

A dissertation submitted in partial fulfilment of the requirements for the degree of Bachelor of Science (Honours) in Computing

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Declaration

I hereby declare that this dissertation entitled Service Robots in the Automobile Salesperson Profession is entirely my own work, and it has never been submitted nor is it currently being submitted for any other degree.

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Signature:

Date:

Supervisor: Esyin Chew

Signature:

Date
Abstract

The number of vehicles produced globally is at an all-time high, and is always climbing. Consequently, the automobile sales industry is thriving and sales are evidently higher than ever before. This means that the life of a salesperson in this industry is tremendously busy. However, if the automobile sales industry is to keep up with this ever-growing demand, something needs to be done to take the pressure off the already overtaxed salespeople.

The aim of this study is to create a prototype robot which can assist salespeople in a vehicle sales dealership by communicating with customers and helping them with their queries. The study will also attempt to explore the subject area of emotion intelligence to try and discern if it would be a constructive feature to implement within the robot.

To achieve the aim of the study, a series of interviews were held with relevant individuals i.e. car salespeople, to determine what would be the best features to include within the robot. The interviews also examined the subject of emotion intelligence and participant views towards a robot and what value it might hold for the industry. The responses identified several key features which would be useful to include within the robot, as well as determining that, for this study, emotion intelligence would be unnecessary.

Based on the primary data collected, a prototype robot was built. This study outlines how various features were implemented and what features may be of use at a later date. Further research could be undertaken to properly explore how emotion intelligence could play a part in the robot’s design, and to complete the robot with full functionality.
Acknowledgements

Foremost, I would like to thank my supervisor Dr Esyin Chew for being so supportive throughout the entire project, and always being on hand to offer assistance and guidance when needed. Without her continuous advice and direction, I am sure this project would not have been accomplished. I would also like to offer my gratitude to my various lecturers who were also on hand to offer help and guidance. Finally, I wish to give my heartfelt thanks to my close friends and family for putting up with my various moods during the past few months, and for always trying to keep me feeling positive.
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Chapter 1: Introduction

1.1 Background
Robotics have been adopted in a wide range of applications used to assist humans in the workplace and provide a service. Traditional applications of robotics include jobs which relieve humans from tasks that may be hazardous, tedious, or exhausting (Nof, 1999), such as in the automotive industry where they are used for welding or where the work requires an extreme level of cleanliness, such as on the assembly lines in the electronics industry.

Robotics also extends its uses outside of factories and into our lives by being applied into industries such as healthcare and education. These non-manufacturing systems are categorised as service robots (Zelinsky, 1998). They can be used in applications such as logistics robots in hospitals transporting medical supplies between wards or even as telepresence robots which allow ill children to still attend school virtually.

In addition to these robots, retail service robots are starting to become widely accepted into the industry. They can be found adopting the role of receptionists in the hospitality industry, featuring as help desk robots in museums or places of interest, and even offering product information to customers in supermarkets and clothing stores.

In some cases, these robots are implemented with artificially intelligent features. One such feature is emotional intelligence which allows a robot to recognise and understand human emotions. This is often crucial for robotic systems to behave in appropriate ways according to the situation which allows them to smoothly integrate with humans. Such features can be, and have been, used for many different projects such as the Pepper robot which can determine how you are feeling and tailor its conversation to suit.

However, despite the wide range of uses which robotics currently adopts, the automobile sales profession remains virtually untouched by robotics. This is apparent as any sort of search, including Google Scholar or Cardiff Metropolitan University MetSearch, on robotics in the automobile sales profession, renders no results.

Despite this, there is a space for robots in the automobile sales industry, and this paper will aim to prove that. Many of the tasks undertaken by an automobile salesperson, mainly asking and answering questions, are repetitive tasks which could fairly straightforwardly be automated and completed by a robot assistant. Further, there is potential for artificial intelligence technologies like emotion intelligence to be integrated in such systems.

1.2 Motivation
The automotive industry is a vital part of the United Kingdom’s economy with over 40 manufacturers operating in Britain, making it the biggest producer of vehicles in Europe. In the first 3 months of 2018 alone, according to the Society of Motor Manufactures and Traders (SMMT), over 718,000 new vehicles were registered in the United Kingdom (SMMT, 2018). Compare this with the first 3 months of 2009, which saw just over 480,000 vehicles registered, that’s an increase of over 49% of vehicles registered in the United Kingdom. Further, in 2016 alone, 2.69 million new vehicles were sold in the United Kingdom (SMMT, 2017).
To keep up with this ever-growing demand for new vehicles, the auto sales industry needs to develop new, effective ways to maintain quality of service and productivity in the work place. Being an automobile sales person can be an incredibly busy job. Much of a sales person’s time is taken up by answering repetitive questions, which could be spent better on more important tasks such as paperwork and actually selling vehicles.

One prospective option is the implementation of innovative technologies such as service robots, which offers the potential to maintain or even improve the auto sales industry in terms of productivity of its employees and quality of service provided to customers, by allowing sales staff to concentrate on sales while a service robot can educate customers.

1.3 Value
The chosen subject area lacks any sort of critical investigation. It is not uncommon to find papers and articles which have conducted research into robotics. However, as you delve deeper into the subject area, you find less research on specific topics. Service robots are well researched, but service robots in the automobile industry are less common to come by. Trying to find research papers or articles on service robots in the automobile sales profession are impossible to come by. This research will therefore add significant value to the current research in robotics.

1.4 Research Aim
The aim of the research is to build a prototype robot capable of communicating with customers to assist staff in day to day running of a car dealership with consideration shown towards implementing artificially intelligent features into the robot, such as emotional intelligence, as a means of making the robot more natural to communicate with. The research will explore current applications of robotics in various industries, whether they be implemented technologies or those in research phase. Primary data will be collected to gain first-hand knowledge direct from those who it directly concerns i.e. car salespeople. The knowledge gained from this data will be analysed and implemented within the design of the robot.

1.5 Research Objectives
The aim of this research project can be categorised into the following main objectives:

- Evaluate the effectiveness of literature sources relating to robotics both at a research level and those implemented in industry.
- Perform primary data collection concerning the opinions of automobile sales personnel on what they feel the robots design and functionality should include, as well as their views towards ideas concerning emotion intelligence, and the value a robot could add to their profession.
- Identify the fundamental findings from the primary data collection to discover what the participants felt were important features for the robot to include.
- Design and build a prototype robot based on the findings and results.

1.6 Dissertation Structure
The dissertation consists of several chapters, each containing a vital section of the overall project. The first chapter is the introduction which explains the topic and field, as well as its
relevance in a wider context. It further consists of the projects overall aim and the objectives which are to be achieved in order to attain it.

Next comes a literature review chapter which acts as a discussion of relevant secondary literature sources to help provide a context into the area of robotics including its early applications, and the various industries which it is applied.

The methodology chapter comes next which outlines the philosophy of the research, the research approach and the methods chosen for primary data collection. This section also outlines the ethical considerations and risks of the research.

The next chapter contains a presentation and discussion of the findings for the primary data which was collected to identify the key points and any information which may be useful to the project in achieving its aim.

A specification chapter will follow to outline the boundaries of the system, constraints which may limit the study, objectives to achieve, permissions required to complete the study, and a description of the end product.

An implementation chapter comes next which details how the findings from the primary data collection was implemented in the design of the robot. This section will be backed up with relevant diagrams and flow charts to show how the robot works, as well as code snippets used to support identification of key features implemented in the robot. This chapter will also outline any missing features or enhancements which could be made in future work.

A chapter for the conclusion is then included which draws all the previous chapters together, identifying any significant findings of the project as well as determining whether or not the aims and objectives originally stated at the beginning of the project were met.

All the sources including literature and websites are referenced in the bibliography chapter of this document using the Harvard referencing method in alphabetical order.

Finally, the appendices chapter includes any additional material used in the research including interview transcripts, full code and links to material such as YouTube videos of the robot.
Chapter 2: Literature Review

“A literature review is a written document that presents a logically argued case founded on a comprehensive understanding of the current state of knowledge about a topic of study” (Machi and McEvoy, 2016). Another key reason for conducting a literature review is its ability to provide insights into previous work (Blaxter et al., 2010). The purpose of this review is to survey books, scholarly articles and various other sources which have already been published relating to the topic of robotics in industry.

2.1 Robotics in Industry

Robots have been used in industry since the 1960s but the number in use across the world has risen year on year. In the mid-1990s, 75,000 robots were deployed annually for use in industry (Nof, 1999). In 2016, industrial robot sales hit 294,312 units, a new peak for the fourth year in a row (Ifr.org, 2017). Robotics are installed in various industries across the world, with the main ones being the automotive and electrical/electronic industries (Ifr.org, 2017). In terms of research, robotics in industry is a popular study area and its popularity is increasing year on year. Figure 1 shows a visual analysis of the results from Scopus when ‘robotics in industry’ is searched. As can be seen, since 1972 various conference papers, articles, books etc. have been written concerning robotics in industry. In 1972, only 2 documents were published and these low numbers were common until 1982 when the number rose dramatically to 39 documents. The latest complete year, 2017, recorded a total of 593 total documents published in this field of study thus proving its popularity.

![Figure 1: The total number of published documents from 1972 to present concerning robotics in industry](image)

2.1.1 Automotive Industry

Industrial robots have been used in the automotive industry in production for more than 50 years. They have been applied in activities which are physically exhausting to employees such as in welding or assembly lines. Currently, the robotics density, which is the number of robots per 10,000 employees, was approximately 1100 across the USA, Germany and South Korea in 2014. The highest density is found in Japan with a density of 1400 (Winkelhake, 2017). The initial applications of robotics in the automotive industry were mainly spot-welding panels to form the body of a vehicle (Wilson, 2015). Appleton and Williams discuss Ford’s engineers’ choice of robots used to complete these welding tasks, mentioning how Ford’s...
assembly line requires KUKA robots for general spot welding application (Appleton and Williams, 1987). Another early stage application of these robots was the painting and underbody sealing of the vehicles due to the unpleasant nature of the job and the need to achieve consistent quality throughout which simply is not possible when using a human equivalent (Wilson, 2015).

2.1.2 Electrical/Electronic Industry
Robotics made its way into the electronics industry in the 1980’s when cleanroom applications were increasingly required due to modern electronics needing to be manufactured and prepared in clean environments. Cleanrooms are isolated environments with controlled humidity and temperature as well as other factors. This area of robotics became known as industrial cleanroom robotics (Mathia, 2010). Most applications of robotics in the electronic industry include the SCARA robot (Figure 2) which stands for ‘selective compliance arm for robot assembly’, which became the most common substrate handling robot in semiconductor manufacturing (Mathia, 2010). These robots are used for assembly of electronic parts and handling of parts.

2.2 Robotics in Services
Robotics is expanding from industrial applications to service-related applications such as in education, healthcare, and retail (Barnett et al., 2014).

2.2.1 Healthcare
Robots have been used in the healthcare environment for some time. In 1991, research conducted by Preising et al. provided a review of robotics employed in the laboratory, in rehabilitation, and in surgery. More recently, however, a review was conducted outlining robotics in healthcare either commercially ready and available on the market or still at the
various stages of research and prototyping (Dahl and Boulos, 2014). The paper separated robots into two classifications: rehabilitation or surgical robots and versatile robots. The latter was further split into sub-classifications: logistics robots, such as the autonomous courier robot Aethon TUG (Figure 3), and therapy robots which serve as companions and have been used to improve medical conditions of patients.

![Figure 3: The Tug robot by Aethon](image)

There are generally three types of robots currently employed in the healthcare industry: transport robots, telepresence robots, and companion robots. In 2009, Lum and D’Amarino discussed the use of laboratory robots for transporting and delivering blood products in the VA Boston Healthcare system. The paper discussed two robots, Aethon and Pittsburgh, which are used for pickup, transportation and delivery of blood products. The robots navigate the hospital using sonar, light whiskers, and lasers with embedded CAD drawings with maps of the medical centre to make their way around, wirelessly communicating to open doors and summon elevators (Lum and D’Amarino, 2009).

Telepresence robots have also been examined in detail. Mariappan et al. describe a telemedicine robot known as OTOROB (Figure 4) used by orthopaedic surgeons to remotely diagnose patients in remote locations.
The Paro robot (Figure 5) was created by Shibata et al. in 1997 as a companion robot. This robot has appeared in many books, journals, and web articles over the years. Resembling a seal puppy both in appearance and behaviour, the robot was anticipated as a therapeutic companion. It can blink its eyes, respond to petting with specific body movements and is able to vocalize (Miklósi and Gácsi, 2012). Many news articles and research papers have identified Paro as a success with hospitalized children, elderly healthcare centres, and in kindergartens. Kidd et al. concluded from their research that, like a real baby, the robot Paro can increase social interactions providing pleasing, feel-good experiences for the residents. The study also identified the benefit of the robots’ ability to communicate its affection from being handled which further increases the desire to interact with it (Kidd et al., 2006).
2.2.2 Education

Robots in education is another area which has been widely researched. In 2013, Mubin et al. presented a review of the field of robots in education to promote a deeper understanding of the area. The study showed that robots are primarily used to provide language, science, or technology education. Also, robots in education take on different roles from being a tutor, tool, or peer in the learning activity (Mubin et al., 2013).

For some students and children, it isn’t possible to attend their place of study due to illnesses etc. Richard Bloss (2011) proposed how telepresence robots, specifically the VGo robot (Figure 6), can come to the aid of students who might not otherwise be able to attend school in person. His findings concluded how a service robot can enhance the educational experience of students by allowing them to independently see, hear, join in with discussions, and even move around school with the use of the robot.

Existing studies show that children with ASD have a natural liking towards mechanical components, computers, and robots (Hart 2005). In 2009, Kozima et al., conducted research into the robot Keepon, their own creation, (Figure 7) using it as part of a three-way interaction between itself, a child, and a therapist. The research revealed that the Keepon robot played a vital role in the interaction.
Tapus et al. completed similar research in social engagement between children with autism and robots. However, using the much more complex and sophisticated NAO robot (Figure 8). The paper presented 4 experiments which aimed to investigate whether children with autism engage better with the NAO robot or with a human equivalent (Tapus et al., 2013). The robot came out on top.

2.3 Retail Service Robots (RSRs)
Retail service robots are intelligent machines which can operate either partially or completely autonomously, capable of aiding customers in the retail sectors (Kiesler & Hinds, 2004). Although these robots are currently not widely employed in the retail industries, they are
designed in such a way that they can provide accurate product information, customer entertainment, engage and interact with customers, and even work hand in hand with human staff, making for a comfortable experience for all (Barnett et al., 2014). As well as these tasks, retail service robots are often capable of conveying emotions and holding natural discussions (Tay et al., 2016). This visual analysis of the results from Scopus (Figure 9), when ‘retail service robots’ is searched, shows that only 28 documents are returned. This means that although robots are a widely published subject, the area of retail service robots has been far less explored.

A relatively old paper focused on the humanoid service robot SAYA (Figure 10). A humanoid robot is a robot with its overall appearance based on the human body (Bahishti, 2017). However, SAYA goes one step further than this. Humanoid is a loose term which can describe a robot which simply has arms or legs. SAYA is modelled to look life-like and looks just like a real woman. The kind of humanoid robots built to aesthetically resemble a human are known as Androids (Bahishti, 2017). It was developed in 2004 to take on the role of a receptionist in Japanese stores. The paper focused on SAYA’s ability to convey, but not perceive, emotion through six natural facial expressions - surprise, fear, disgust, anger, happiness and sadness (Hashimoto et al., 2006).
2.4 Emotional Intelligence in Robots

In recent years, the attention has moved from developing and progressing service robot hardware to the application level as society demands more and more utilities and worth to be gained from robots (Lee and Sabanovic, 2014). A key area being researched is mood and emotion which plays a vital role in human interaction. People generally treat computer agents in the same way that they treat people. Assuming there is good human-computer interaction, this allows for social relationships to be formed (Reeves and Nass, 1996). This area of human-robot interaction and emotional intelligence has been investigated where Roboceptionist (Figure 11), a receptionist robot, is used to provide guidance and directions and can also react to moods and emotions (Kirby et al, 2010). The paper aimed to mimic how people emote to produce as natural-seeming a system as possible.
A study by Breazeal and Brooks (2005) explored the application of emotion theory to robotics by building a sociable robot, called Kismet (Figure 12). Kismet can express emotion through various facial expressions, body postures, and voice tones. In doing so, Kismet can socially regulate people’s behaviour and actions towards it in a natural way. According to the researchers, these capabilities allow for robots to become more natural and simpler to interact with. They explain how robots that interact with people as capable partners need to possess social and emotional intelligence so that they can respond to and interact with people appropriately... upon hearing that angry “no!” the robot may express its chagrin in an emotional display so that the person understands intuitively that their command has been heard and will be reflected upon (Breazeal and Brooks, 2005).

Perhaps the most well-known emotionally intelligent humanoid service robot is Pepper (Figure 13), described by its creators as “the first humanoid robot capable of recognising the principal human emotions and adapting his behaviour to the mood of his interlocutor” (SoftBank Robotics, 2018). Introduced in 2014 by SoftBank Robotics, more than 140 SoftBank Mobile stores in Japan are currently using the Pepper robots as a way of welcoming, informing, and amusing customers (SoftBank Robotics, 2018). A study by De Gauquier et al, gathered results from participants who were asked to take a quiz on either a tablet kiosk or a Pepper robot. The study revealed how better results, in terms of shopper impressions and behaviour, were gained from the Pepper robot (De Gauquier et al., 2018). Another study, using the Pepper robot, set out to investigate whether humanoid service robots would perform better than service employees. One of its hypotheses stated that “Positive disconfirmation of customer expectations toward a Humanoid Service Robots (HSR) innovative service behaviour positively affects (a) customer satisfaction and (b) delight with
the HSR” (Stock and Merkle, 2018). This was ultimately proven true as during testing the HSR clearly exceeded the participants’ expectations.

On the one hand, SAYA is a humanoid robot which was developed to look life like and, as already alluded to, can convey emotion through facial expressions. On the other hand, Pepper is an intelligent service robot which can recognise human emotion and adapt to its behaviour where necessary. Until recently there was no combination of these two elements. However, a new humanoid robot has been built with the latest advances in AI which allow it, for example, to learn and gain experience from its interaction with human beings. Also, its appearance and complex collection of facial gestures that it has makes it extremely lifelike, as close to the human pattern as any robot has done. The humanoid, known as “Sophia”, was recently used as the centre of a study called the “Loving AI” project. It involves developing software enabling humanoid robots to interact with people in loving and compassionate ways, and to promote peoples’ self-understanding and self-transcendence (Goertzel et al., 2017). The goal of the project was for “robots and associated AI technologies to express unconditional love toward humans and to help humans achieve greater states of well-being and advance their states of consciousness.” (Goertzel et al., 2017). Sophia is perhaps the greatest leap forward in AI robotics, and is still far from finished. In its short life, Sophia has already been accredited as the first World Citizen Robot by Saudi Arabia (Retto, 2017).

Table 1 identifies the key technical specifications of the two Softbank robots – namely the Nao and Pepper robots.
Table 1: Comparison between the Nao and Pepper robots

<table>
<thead>
<tr>
<th></th>
<th>Nao</th>
<th>Pepper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (mm)</td>
<td>Height: 574</td>
<td>Height: 1210</td>
</tr>
<tr>
<td></td>
<td>Depth: 311</td>
<td>Depth: 480</td>
</tr>
<tr>
<td></td>
<td>Width: 275</td>
<td>Width: 425</td>
</tr>
<tr>
<td>Battery</td>
<td>Charge Time: &lt; 3h00</td>
<td>Charge Time: &lt; 8h00</td>
</tr>
<tr>
<td></td>
<td>Battery Life: 1h30</td>
<td>Battery Life 12h00</td>
</tr>
<tr>
<td>Speaker(s)</td>
<td>2x Loudspeakers</td>
<td>2x Loudspeakers</td>
</tr>
<tr>
<td>Microphone(s)</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Tablet</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Motherboard</td>
<td>Processor: Atom Z530</td>
<td>Processor: Atom E3845</td>
</tr>
<tr>
<td></td>
<td>CPU: Unspecified</td>
<td>CPU: Quad Core</td>
</tr>
<tr>
<td></td>
<td>Clock Speed: 1.6GHz</td>
<td>Clock Speed: 1.91GHz</td>
</tr>
<tr>
<td></td>
<td>RAM: 1GB</td>
<td>RAM: 4GB</td>
</tr>
<tr>
<td></td>
<td>Flash Memory: 2GB</td>
<td>Flash Memory: 8GB</td>
</tr>
</tbody>
</table>

The table also outlines some strengths and limitations of each of the robots. The NAO robot has a considerably shorter charging time in comparison with the Pepper robot – Almost 3x quicker – 3 hours compared to 8. This a limitation with the Pepper robot as its long charging times can lead to frustration for the user. However, to counter this, the Pepper robot outlasts the NAO robots’ battery life lasting up to 8x longer on a single charge – 12 hours compared with 1.5. The short battery life could make it difficult for the NAO robot to operate as a competent service robot in the automobile sales profession as it would need to be active for at least 8 hours a day with some vehicle dealerships staying open for upwards of 10 hours. Fortunately, the NAO robot, like the Pepper robot, can be used while connected to a charging port but this has two drawbacks. Firstly, it powers the robot but does not charge the batteries. Secondly, the robot is restricted with how far it can travel and move when hindered by a charging cable.

Although the NAO robots’ motherboard specifications are considerably less powerful than the latest generation Pepper robot, it uses the same system as the older generation Pepper robot so it is sufficiently powerful enough to manage the NAO robot.

Finally, one of the biggest strengths of the Pepper robot which would be of benefit in the automobile sales profession is its addition of a tablet. This could potentially allow organisations to display vehicle information etc. on the screen and have the robot explain it.

Unfortunately, the project did not have the financial resources to choose either of these robots, instead opting to use the EZ-Robot JD humanoid (Figure 14). However, if the project were to be a success, future designs would be conducted using the NAO robot. This decision has been made for the following reasons – The NAO robot is better than half the price of the Pepper robot at $9,500. Also, the NAO robot offers the same number of microphones and speakers as its more expensive brother offering a similar listening and speaking ability. The NAO robots’ smaller design makes it effective at not taking up too much space on a shop floor and potentially getting in the way, while its full android style body with arms, legs, head etc. make it more human-like than the Pepper robot which is only partially human-like offering wheels rather than legs. It is also worth noting that, as mentioned earlier in this chapter, a study by De Gauquier et al. concluded that customers responded better to using a
robot rather than a tablet kiosk so perhaps this tablet feature is not such an essential feature to have. Finally, although the NAO offers a relatively low battery life, its ability to be plugged in while in use compensates for this issue as the idea for the robot is to be stationed in a single location not walking around a vehicle showroom.

2.5 Robotics in the Car Sales Profession
After extensively searching the internet for scholarly articles, papers, or books on robotic car salesmen, or robotic car sales assistants, no published research was found relating to this field. However, the UK based firm known as Robots of London offer a Pepper robot which could be used as a car salesperson (Robots of London, 2018). The site discusses the robots’ abilities to interact with customers in a waiting area or even describe to customers the vehicles on offer. From the research, there are no other offerings like this one in either internet searches or scholarly article searches. However, a patent was put forward by the Honda Motor Co (2005) for a salesperson robot system. The technical description given was of a salesperson system that includes a salesperson robot (Figure 15) to explain features of vehicles to potential buyers with access to a database of information for both customers and products, as well as a camera to capture customer faces and remember them if they returned to the store (Honda Motor Co., Ltd., Tokyo, 2005). The patent was submitted in 2004 and abandoned, then submitted again in 2005 but is still awaiting confirmation of the patent. It can be assumed that no further progress will be made with this idea.
2.6 Conclusion
2.6.1 Summary
The literature review has shown that a lot more research is being conducted into the application of service robotics now than ever before. Between 2016 and 2017, the number of service robots sold increased by 24% from 48,018 units to 59,706 according to the executive summary of world robotics 2017 (Ifr.org, 2017). The research has also given insight on how service robots are continuously advancing into new industries, the current developments have an emphasis on human-robot interaction and how robots can assist in industries such as hospitality and retail. It is also apparent that recent studies seem to be orientated around emotional intelligence, such as in the case of Pepper and Sophia.

2.6.2 Constraints and Recommendations
Although it is clear there is huge potential for service robots in the retail industry, such as sales and customer service in supermarkets, very little has been done to address the potential for service robots to enter the field of car sales. However, many of the roles of a car salesperson can be considered repetitive and could easily be completed by a robot assistant. Roles of a car salesperson include discussing customers’ needs, discussing features of different vehicles, and working out finance (gov.uk, 2017). These are tasks which could be completed by a robotic assistant leaving the salespeople to complete the more important tasks like selling the vehicle and completing paperwork. In a vehicle dealership, potential buyers may require large amounts of information before they make a buying choice (Honda Motor Co, Tokyo, 2005). Although it is essential that the salesperson gives this information, depending on the circumstances i.e. busy periods in the showroom, it may not always be possible to give this information therefore potentially losing a sale. A robot would be able to assist in such circumstances giving full detailed information to customers. Often, information is stored on a computer which requires a salesperson to operate the computer. With a robot assistant, the computer can relay information directly to the customer (Honda Motor Co, Tokyo, 2005). It is, therefore, a very feasible idea to introduce robots into the automobile sales industry and so this research will be a significant contribution to the, at present, unexplored area of study.
Chapter 3: Methodology

3.1 Introduction

The methodology is a discussion of the research strategy that aims to summarise the way in which the research has been undertaken, including the methods used. These methods set to outline the means or modes of data collection (Howell, 2013). The word methodology is defined as being a system of ways of doing, teaching, or studying something (McIntosh, 2013). The research methodology has been formulated to follow the steps of Saunders Research Onion (Figure 16) (Saunders et al., 2007).

![Saunders Research Onion](image)

Figure 16: Saunders Research Onion

3.2 Philosophy

The subject area of robotic assistants in the automobile sales profession, as already discussed, has not been explored extensively enough and so there is very little in terms of research being or having been conducted. For this reason, an objectivist epistemology was deemed inappropriate as being objective means to confine your attention to the experimental evidence (Blyth, 1972). With next to no existing research and therefore any relevant and valid evidence denied, relying on an objective approach is impossible. The research thereby warranted a constructionist epistemology, specifically the perspective of interpretivism, which aims to study and reflect on the inner feelings of participants. An interpretive philosophy plays an important role in producing an end result from collected data. The researcher plays the role of making sense and interpreting the collected data. According to Orlikowski and Baroudi (1991):

Interpretive studies assume that people create and associate their own subjective and intersubjective meanings as they interact with the world around them. Interpretive
researchers thus attempt to understand phenomena through accessing the meanings participants assign to them.

Table 2 outlines the differences between objectivism and constructionism in terms of methodology and methods adapted from Michael Crotty’s book, The Foundations of Social Research: Meaning and Perspective in the Research Process (Crotty, 1998).

Table 2: Objectivism vs Constructionism

<table>
<thead>
<tr>
<th>Epistemology</th>
<th>Theoretical Perspective</th>
<th>Methodology</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectivism</td>
<td>Positivism</td>
<td>Experimental research</td>
<td>Sampling</td>
</tr>
<tr>
<td></td>
<td>Post-positivism</td>
<td>Survey research</td>
<td>Measurement and scaling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Etc.</td>
<td>Statistical analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Questionnaire</td>
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<td></td>
<td></td>
<td></td>
<td>Focus group</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Interview</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Etc.</td>
</tr>
<tr>
<td>Constructionism</td>
<td>Interpretivism</td>
<td>Ethnography</td>
<td>Qualitative interview</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grounded theory</td>
<td>Observation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phenomenological research</td>
<td>Participant</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heuristic inquiry</td>
<td>Non-participant</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Action research</td>
<td>Case study</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Discourse analysis</td>
<td>Life history</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feminist standpoint research</td>
<td>Narrative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Etc.</td>
<td>Theme identification</td>
</tr>
</tbody>
</table>

3.3 Approach
Due to the interpretivist philosophy of the research, the study adopted an inductive research approach. A deductive approach would usually identify a hypothesis and aim to test and prove it, but the research set out questions not a hypothesis and an inductive approach will usually use research questions to narrow the scope of the study (Gabriel, 2013). Further, an inductive approach is better suited to qualitative research whereas a deductive approach is usually best fit for quantitative research (Gabriel, 2013). As already mentioned, the study area has next to no existing research associated with it and so a quantitative research method was not applicable due to there being no statistical figures in which to analyse. Therefore, qualitative research was carried out which worked well with the inductive approach. Table 3 outlines the differences between qualitative and quantitative research methods as presented by Tilahun Nigatu Haregu (Haregu, 2012).
### Table 3: Qualitative vs Quantitative

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Qualitative</th>
<th>Quantitative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>To describe a situation and gain insight to a particular practise</td>
<td>To measure magnitude – How widespread is a practice...</td>
</tr>
<tr>
<td>Format</td>
<td>No pre-determined response categories</td>
<td>Pre-determined response categories, standard measures</td>
</tr>
<tr>
<td>Data</td>
<td>In-depth explanatory data from a small sample</td>
<td>Wide breadth of data from large statistically representative sample</td>
</tr>
<tr>
<td>Analysis</td>
<td>Draws out patterns from concepts and insights</td>
<td>Test hypotheses and uses data to support conclusion</td>
</tr>
<tr>
<td>Result</td>
<td>Illustrative explanation and individual response</td>
<td>Numerical aggregation in summaries and responses are clustered</td>
</tr>
<tr>
<td>Sampling</td>
<td>Theoretical</td>
<td>Statistical</td>
</tr>
</tbody>
</table>

### 3.4 Access

In order to gather primary data for the study, it was important to gain access to an appropriate source within the automobile sales profession. As a friend of an employee within the auto sales industry, and past experience working in a similar environment, the researcher was in a good position to get access to appropriate personnel.

After getting in touch with a friend who currently works as a salesperson, the researcher was able to discuss the ideas for the dissertation project. They were able to spread the word out on the researchers’ behalf and gather interest from potential participants, and in a short space of time, 5 participants were chosen from various vehicle dealerships. As the research was not invasive to the participant’s privacy or safety, none of the participants objected or placed limitations with regards to the questions put forward to them or the motive of the study. The research decided to conduct interviews with salespeople from various organisations in order to broaden the sample. This is to enable the research to create a design inclusive of features that would benefit more than just a single dealership but would encompass the needs of various organisations thus planning for future expansion.

### 3.5 Research Strategy

The research strategy is how the researcher intends to carry out the work (Saunders et al., 2007). There are four strategies best fitted to qualitative studies – Action research, case study research, ethnography and grounded theory. The research decided to adopt an ethnographic approach. Ethnographers immerse themselves in the lives of the people they study (Lewis, 1985) by close observation, examining their cultural interaction and meaning (Bryman, 2012). This method allows for various perspectives to be including in a systems design and to support a designer’s understanding – including the goals and context(s) of its use – and therefore it is possible to create a far better solution than would otherwise be possible. Therefore, as the study aims to understand the features an automobile salesperson
would find most beneficial and helpful to be included on a robot assistant, the ethnographic approach was decided to be the most effective means of investigating and gathering this required information.

The approach chosen to gather the data in this investigation was through the use of interviews. This method is outlined in the table 4.

**Table 4: Research Strategy**

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Aim</th>
<th>Sample</th>
<th>Types of Questions</th>
<th>Method of Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualitative semi-structured interviews</td>
<td>To identify the features and roles the robot would require to be used as an assistant in a vehicle showroom and gain insights into employee opinions towards the prospect of a robot assistant</td>
<td>5 automobile sales employees within the auto sales industry</td>
<td>Open-ended questions</td>
<td>Narrative</td>
</tr>
</tbody>
</table>

**3.5.1 Qualitative Semi-Structured Interviews**

Five sales personnel took part in 5 to 10-minute individual interviews. The interviews were a qualitative method of inquiry known as semi-structured interviews which enabled the researcher to combine a set of pre-determined open-ended questions as well as offering the opportunity for the researcher to further deepen the discussion and explore particular themes and responses further. The aim is to provide in-depth findings through informal discussions with participants (Collis and Hussey, 2003). The interview method was chosen over unstructured or structured interviews as the researcher knew the types of questions they wanted to ask, but did not want to restrict the participants from adding any additional information which may have been useful to the study. It also made it possible to tailor the interview questions depending on certain variables such as the participants experience. The semi-structured interviews also gave the researcher the ability to probe the participant’s answers. Probing is the skill of asking a penetrating question in response to an initial answer. In doing so, the participant is required to articulate the subtler attributes of the topic under discussion (Brown, 1979). This was especially useful when interview participant’s responses were quite vague and needed further explanation to fully understand.

The participants all had varying degrees of experience and seniority level within their profession. All the participants were asked the same set of pre-determined questions regardless of this. Therefore, the research was such that respondents all gave their own input
to each question leading to a greater range of answers, views, and ideas rather than asking particular questions to chosen individuals. Table 5 outlines the participant’s details.

Table 5: Interview Participants Details

<table>
<thead>
<tr>
<th>Participant</th>
<th>Fictional Name</th>
<th>Role</th>
<th>Years in Profession</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>John</td>
<td>Vehicle sales executive</td>
<td>2</td>
</tr>
<tr>
<td>P2</td>
<td>Greg</td>
<td>Vehicle sales executive</td>
<td>5</td>
</tr>
<tr>
<td>P3</td>
<td>Mary</td>
<td>Sales manager</td>
<td>12</td>
</tr>
<tr>
<td>P4</td>
<td>Lewis</td>
<td>Vehicle sales executive</td>
<td>4</td>
</tr>
<tr>
<td>P5</td>
<td>Robert</td>
<td>Vehicle sales executive</td>
<td>1</td>
</tr>
</tbody>
</table>

In terms of the interview participants, no extra considerations were made for race, religion, or gender so as not to impact on the validity of the data collected. The participant’s right to anonymity was reiterated throughout the research process. This was to protect the participant from any comebacks from organisations who could misinterpret the contents of the study and the answers given. To maintain the research’s readability, the participants have therefore been given fictional names.

3.6 Data Collection

3.6.1 Sampling Method

Due to constraints in both time and resources, it was not possible to interview a particularly large sample of participants. As a result, opportunity sampling was required to choose research participants. Opportunity sampling involves selecting participants on the basis of their availability (Eysenck, 2006) and that they fit the criteria which is required.

A random or even stratified sample method would have been better at representing the target population, however, the costs in terms of time and potentially money vastly outweigh that of an opportunity sample. Further, it would be difficult to choose a stratified sample method as the researcher only has access to a small number of vehicle dealerships in the local area, with a total number of vehicle sales personnel equalling less than 20. Therefore, it would be incredibly difficult to use stratified sampling as it requires the researcher to select a sample and break it down into subcategories. With so few potential participants to start with, this wouldn’t be a feasible option.

3.6.2 Primary Data Collection

The researcher chose to record the semi-structured interviews using the voice recorder built into their mobile phone. The conversations from the five participants would be transcribed word for word, and expression for expression. Transcribing the interviews makes it easy to reference material further on, keep a record for extra security in case the original file becomes lost or corrupted, and to ensure the researcher grasps the full meaning of the interviewee if there were accent barriers for example. The full transcripts can be found in the appendices of this paper.
3.7 Analysis of Research Findings

3.7.1 Qualitative Data
A narrative analysis technique was used to analyse the results of the transcribed interviews. Narrative inquiry is a method in which the researcher can systematically gather, analyse, and represent people’s stories as told by them (Keele.ac.uk, 2018). Presentation of findings and the analysis will be combined as one chapter.

3.8 Ethics
It is the researchers’ job to design a project which is not going to affect the rights and safety of the interviewees or respondents. This is vital in order to advocate, promote, and protect their rights (Blumberg et al, 2005). The potential issues, and steps to prevent such issues, are discussed below:

- The interviewee may not want to answer questions if the information is confidential or personal.
- The interviewee may be offended by some of the questions.
- The researcher may unintentionally say something which could unnerve or make the interviewee panic. This may progress into anger towards the researcher.

Apart from these ethical considerations, no other dilemmas were found concerning the research. To prevent the potential issues discussed above, the interview questions were designed in such a way that they would not offend, harm, provoke, stress, or put any of the participants at risk in any way. No personal information, including name, age, or gender, was requested from the participants in order to preserve their anonymity. Further, a participation information sheet and consent form were given to the interviewees to ensure they were aware of the topics up for discussion. All participants were notified that the researcher will have sole access to the data collected and data used in the written report would be anonymised and the participants identified using fictional names to safeguard from identification.

3.9 Limitations

- Due to geographical and financial limitations, the researcher was only able to gather qualitative data through interviews from a compact location. As a result, a larger number of participants could not be interviewed which would have enhanced the data gathered. Also, data from other regions could have been useful in outlining different needs from different demographics.

- Despite the data collection being conducted anonymously, with care taken to preserve participant’s identification in all aspects of the study, some vehicle sales personnel were still unwilling to participate due to fear of their personal information being at risk of being used against them. Therefore, the list of participants was limited to just five.
Chapter 4: Results and Analysis

4.1 Interview
This section will aim to present and analyse the results from the interviews with participants.

4.1.1 Background Information
The participants’ level of experience varied throughout the study. Some had only been in the profession for around a year, whereas others had as much as 12 years of experience in the job. Also, although most of the participants were employed at a salesperson level, one of the participants was a sales manager within the profession. This set the study up for a good range of opinions and views.

4.1.2 Common Questions Salespeople Get Asked
In the first part of the interview, participants were asked the question of what are the most common questions they get asked on a regular basis. This question received a wide range of responses. John responded that the questions really depend on the type of customer as there can be customers who “know what it is they want and have just come in to buy it or they want [salespeople] to help them decide by a process of sort of finding what best suits their needs”. Already this identifies that the robot would need to be able to deal with both these types of customers to help give the best service possible.

In terms of actual questions, money seemed to be the most common question area. Whether it be for purchasing or leasing a vehicle, John explained how “you’ll always get asked about price”. These questions can include asking about “lease prices on particular cars or what’s the best lease deal” and likewise cash buyers will also ask for vehicle pricings and the best deals on offer. This was a view shared by Robert, who explained that “price is always the top question you get asked a salesperson”. It is therefore apparent that the robot’s design will need to include the ability to discuss price with the customers in the showroom, and have all the necessary prices included such as lease price and purchase price. The importance of this feature is made evident by Mary who discussed how

price is always a common question as I’m sure you can imagine, I mean we are in the sales industry after all so you are going to expect one of the most common questions I guess to be about the price of what we are selling.

As various participants emphasised the frequency in which this subject is asked about, and the importance of it, this will be a significant feature of the robot’s design.

John also discussed how the most common questions tend to be the more basic questions. Aside from asking the price, many customers will ask simple things like “what’s the MPG? What engine options are available?”. This information, which both John and Robert mentioned, can be found on the information sheets next to each car comprising of information like “name of the car, price, trim options… power, engine size”. This indicates that it would be useful if the robot would be able to relay this sort of rudimentary information to the customers when talking about the vehicles as Robert explained that the information sheet is “enough to answer most customers questions”. This is supported by Lewis’s comments who said that “most queries you tend to get are about simple stuff” such
as MPG, engine options, etc. This suggests that customers require a high volume of information before they choose a vehicle. This supports the view from Honda in the review of literature in chapter 2, which stated that in a vehicle dealership, potential buyers may require large amounts of information before they make a buying choice. The ability to relay large volumes of information is therefore a requirement to be considered in the prototype.

Customers tend to frequently ask about service plans that are available with the vehicles. These service plans, according to Mary, are

        a monthly subscription a customer can pay and for that you get, as a bare minimum, an annual service consisting of oil change, vehicle health check, and various filter changes. But they can also include air con refills and stuff like discounts off things such as MOTs.

Giving the robot the ability to offer customers service plans is an important design feature for the robot as after much research, it was found that it is very common for manufacturers to offer servicing plans on new cars (Ingram, 2018) and therefore it would be a necessary feature for the robot to include.

When posed with question of if they thought the replies to these sorts of questions could be carried out by a robot, all the participants said yes, they could. However, a few points were raised where in some cases a robot would not be able to handle certain questions, for example, being asked about test drives. In cases like this, human intervention would be needed.

4.1.3 Common Questions Salespeople Ask
The participants were then asked about the common questions they ask customers. Although not a question, a greeting to the customer is often the most common and important thing a car salesperson must first do. According to Greg, “that’s what all salesmen do, and if they don’t they’re not a good salesman”. This acts as a good platform to move on from so, as John explained, you can ask the customer “what is the purpose of their visit”. It is therefore a vital design feature that the robot can do this by greeting the customer and asking how it can assist them.

Asking the question of how the customer will pay for the vehicle is also an important area discussed by many of the participants. This is important for several reasons. As pointed out by Mary,

        you need to find out if they are looking to purchase the vehicle outright or if they want to pay for it through finance or even just lease the vehicle for a certain period. Not every vehicle we have is eligible for all 3 of those options. So, before I can even think about offering someone a test drive in something then I guess I need to know if it’s even possible for them to have the car.

It was also pointed out by John that you “can’t show [someone] a 30-grand car if they only got 10 to spend”
The subject of budget often followed shortly after discussing payment method. According to Lewis, it’s important to know the customers budget “so you know what they can afford to spend on a car”. It’s important to know both the budget and payment method to really narrow down the options which can be shown to the customer and to really give them the best service possible, so including these questions into the design of the robot, which the robot can therefore ask, is a useful and important thing to consider.

As well as acquiring this information, it is also important to get a better picture of the customer’s needs, which can be done through asking a series of simple questions which really narrow down the options for the salesperson. In Johns opinion, the common ones are things like asking like how many are in the family because then you know like what size car they will need. I suppose you may want to know things like the age of the family as well. A small engine will struggle with a group of large adults.

Mary held a similar view to this, explaining how “the most common questions... are about asking what it is exactly the customer wants from their new car things like how many seats do you need? What body-type are you looking for?”.

In addition to the people who will be using the car, it is also important to know how the car will be used. Greg explained how you can ask questions like “will you be doing a lot of mileage in the vehicle... Will you be towing trailers or a caravan?” to really build up a picture of what vehicles you can and cannot offer somebody. Asking these sort of check-list style questions is an effective way in which a salesperson can reduce their options down and give the customer a finer selection of offerings which are far better suited to their needs than if they were to simply ask for information about every vehicle in the showroom. It is a crucial feature to include in the robot’s design that it can ask such questions and help the customer to choose a specific vehicle.

When asked if they thought these questions could be carried out by a robot assistant, the participants all agreed that yes it would be able to carry out such a task. A few participants likened it to being like a chatbot simply asking a series of questions until you reach a result.

4.1.4 Emotion Intelligence

The next stage of the interview was to ask the participants what their knowledge of emotion intelligence is. When posed with this question, most replied like Mary’s response of “I may have heard of it but no I couldn’t define it”.

Once the term was explained to the participants, they were then asked if they believed this would be a useful feature to include in the design of the robot as one of the aims of the research, as set out in the introduction to this paper, was that consideration would be shown towards implementing artificially intelligent features into the robot such as emotion intelligence. As already noted in the review of literature in this study, “robots that interact with people as capable partners need to possess social and emotional intelligence so that they can respond to and interact with people appropriately” (Breazeal and Brooks, 2005), so it was interesting to find out the participants views towards this idea.
In response to this question, 3 out of the 5 participants completely objected to the idea of having an emotionally intelligent robot. Some participants believed that having a robot asking what’s wrong will only make matters worse. John’s explanation was that “if it’s a robot that’s made the customer unhappy then no the robot asking what’s wrong will just make them irate”. Greg described the idea as “naff” and went on to explain that “I don’t think a robot ever needs to understand if I’m sad to be honest like what’s it going to do about it even if I was”. Finally, Mary pointed out that it wasn’t a “beneficial” feature to include, and that “just doing its job answering questions is probably sufficient”. These explanations are fair, with Mary making the key point that perhaps it is not a necessity to include such a feature in what is essentially a chatbot.

However, some of the participants did show support for the idea, with Lewis offering a means in which emotional intelligence might be integrated by saying “it could detect if someone was unhappy and maybe alert a staff member”.

4.1.5 Participant Views Towards a Robot Assistant
Firstly, the participants were asked if they felt a robot assistant could add value in the workplace. A wide range of answers were received, both from those in favour and those against. A point raised by John was that salespeople get very busy days where your just rushed off your feet with so many tyre kickers and time wasters that take up a load of time and if it could take care of them that would be something.

This was a point echoed by Mary who also explained how the job can be “very busy sometimes, really rushed off your feet busy, so something to take the pressure off would be welcomed with open arms”. It’s therefore obvious that a system like this would really be able to add value to the automobile sales industry during busy periods to take the stress away from employees.

On the other hand, some participants, like Lewis, expressed concerns that it wouldn’t “be received well by the customers... they would prefer to talk to a human”. However, they went on to explain how “it all comes down to the individual... if you asked a hundred customers you may get very different answers”. Therefore, it is obvious that until the idea is tried, no one knows how it will be received.

Secondly, the participants were asked on their views towards a robot assistant. Again, the responses were mixed. Some were positive towards the idea, like John who thought “it would be alright... it would definitely get used by the customers it’s something new [and] something a little modern”. On the other hand, some participants expressed their concern about job losses. Greg explained how they “never liked the idea of robots taking jobs... I just think the job cuts will start coming along”.

4.2 Conclusion
After analysing the results of the interviews, some key findings were made which would be used for the design of the robot. Firstly, the robot should have the ability to greet customers
when they enter the showroom rather than the customers having to start the conversation as this was identified as an important part of a salespersons job.

Secondly, the robot must have the ability to help a customer choose a vehicle by asking a series of questions which will narrow down the options, including price, purchase method, etc.

Thirdly, the robot should be able to offer key information about specific vehicles, such as rudimentary information like MPG, tax band, etc.

Finally, it would be a good feature to include in the robot’s design that it could offer a tailored service plan option depending on the customers chosen vehicle. These features were taken into consideration in the following implementation chapter.

In terms of emotional intelligence, for this study no further consideration will be given towards implementing the feature into the robot’s design due to time constraints and considering the participants views towards the idea. However, this will be a feature which could be examined further in later studies.

The participants view towards the idea of a robot assistant were satisfactory. It was to be expected that responses would be mixed and not everyone would be for the idea. However, it is positive to see that various individuals were accepting to the idea in their personal view, and more importantly it was seen by many as a tool which could add value to the vehicles sales profession.
Chapter 5: Specification

5.1 Scope
After analysis the results of the in chapter 4, it was made clear which features would be most effective and useful in the robot’s design. The robot to be used is a JD robot by the EZ-robotics company and will be coded with the EZ-Script programming language.

5.1.1 System Boundaries
“This will define the area of the organisation under investigation and may also specify the limit of any system implemented as a result of the project” (Yeates and Wakefield, 2004).

A chatbot style system which will aid customers in various tasks. All knowledge and responses are held within the JD robot and can be accessed at any time.

5.1.2 Constraints
“Factors, including budget, timescale and technology, which may restrict the study, or the solution in some way” (Yeates and Wakefield, 2004).

The project will need to be completed by the 30th of April 2018. Budget is not a factor for this project because, both the robot and the programming language are available through the university free of charge.

5.1.3 Objectives
“An unambiguous statement of the expectations of those in the client’s organisation who have initiated the project. These may be broken down by function or department. Well defined objectives are clear and measurable” (Yeates and Wakefield, 2004).

The objective of the study is to develop a prototype robot capable of interacting with customers in a vehicle dealership and assisting staff members with consideration shown towards implementing emotional intelligence into the robot.

As mentioned in section 4.2, there were 4 main features which were decided could be implemented within the robot’s design in the given time frame, although with more time it would be possible to achieve more than just these features. As a minimum, it needs to be able to greet customers, give them information on specific vehicles, help them choose a vehicle, and build them a custom service plan. In future, features such as comparing two vehicles, or even entertaining customers in the waiting room, could be implemented. The robot is also capable of facial recognition as well as detection, so in future rather than just greeting a customer when it identifies a face, it could learn customers names and remember them when it sees that face again. It was also decided to abandon any further research into the area of emotional intelligence due to the participants views towards it, and time constraints on the project.

5.1.4 Permissions
“This will indicate who in the client’s organisation is responsible for the supervisor of the project, and, if permission needs to be granted – for example to extend the scope of the analysis – who has the authority to do so” (Yeates and Wakefield, 2004).
5.1.5 End Product
“A description of the deliverables or end products of the investigation” (Yeates and Wakefield, 2004).

After analysis of the results from primary data collection, a prototype robot can be created. The implementation will consider the reviewed robots in the literature review and results of the interviews.
Chapter 6: Implementation

6.1 Introduction

The following section outlines how the features discussed in the conclusion of the results chapter were implemented into JDs design, including initial flow charts from which the robot was programmed according to, and key code snippets which show how the robot was programmed. The full code can be found in the appendices. Further, the links to the video of the JD robot performing the processes mentioned in this study can also be found in the appendices of this paper. Finally, the flow charts have been included in the appendices and have been blown up in size to make them more readable and understandable.

6.2 Greeting Customers

Greeting the customer was a key feature to include in the design of the robot, as well as the participants stressing its importance, various books and internet articles also emphasize the significance of greeting a customer. It’s very important to greet customers when they arrive at the dealership, greeting them warmly, else it sends a terrible message (Polino, 2009).

The study made use of the JD robots built in camera as a method of effectively greeting customers. Without a camera, the robot would have to rely on being activated by a customer triggering the conversation, such as the customer saying ‘hello’ and the robot replying ‘hello, how can I help you’. With the camera, however, it was possible to use JDs facial detection ability which allows the robot to detect when a face is in view of the camera. Using a feature called tracking, the robot can be programmed to identify colours, faces, motion, etc. and execute code when these are identified. The image below (Figure 17) is a screenshot of the code which enables JD to greet the customers once a face has been detected using tracking.

```c
# Turns off the microphone so the robot doesn't react to other noises in the background
ControlCommand(“Speech Recognition”, PauseOn)

# Wave to the customer to add some humour and make the customers smile

# Friendly greeting to the customer
SayAndWait(“Hello there! My name is JD. What can I help you with today?”)

# Activates the microphone again so the robot can listen for any replies
ControlCommand(“Speech Recognition”, PauseOff)
```

Figure 17: JDs code to greet customers when a face is detected

As well as including a warming welcome message, the robot also waves to the customer as a means of giving the robot a bit of character and humour, so the customer isn’t just communicating with an idle piece of machinery (This can be seen in figure 18). As discussed by Reeves and Nass (1996) in the literature review, assuming there is good human-computer interaction, this allows for social relationships to be formed.
6.3 Advising Customers
As already pointed out by Mary it is important to note firstly that a lot of the people who walk into the showroom tend to be browsing... They often will explain how they may be coming into some money or that they may be considering getting a new car so really people will just want an idea of what is on offer to them... They won’t have too many specific questions or queries to ask they just want some information.

So, therefore, it was a vital feature of the robot that it could advise a customer and narrow down their options until they have reached a conclusion, i.e. chosen a vehicle. JD was programmed with the ability to guide customers through these steps. Figure 19 is a flow chart which details a typical scenario whereby a customer answers various questions until they reach, in this example, a lease deal for the Vauxhall Viva SE.
First and foremost, the customer is asked the question ‘how many people will need to be seated’, a question raised by most of the interview participants to determine the vehicle size they require. The if statement shown in figure 20 shows how if a customer responds between 1 and 5, they are offered the full range of vehicles on offer.
However, the next ELSE if statement in figure 21 shows that if the customer responds either 6 or 7, then only MPVs and SUVs are made available to the customer as the other types cannot carry more than 5, thus narrowing down the options.

```javascript
ELSEif ($response == "six" OR $response == "seven")
  SayEZWWait("Thank you. Would you prefer an mpv or an suv?")
```

In this example, if the customer chooses a hatchback, they are asked if they will be towing a trailer or caravan with the vehicle, another question which the participants of the interviews outlined as a common one to ask. If the customer answers yes, as shown in figure 19, they are offered advice from JD not to tow with a small car, and are given the choice to proceed or change their choice of vehicle. As John mentioned in the interview, some customers ‘need us to help them decide what best fits their needs’, so advising the customer against certain decisions for their benefit was an important feature to include in JDs design.

If the customer proceeds with their choice, they are given a list of the vehicles on offer which suit their requirements. As shown in figure 19, all the hatchback vehicles are listed.

The customer can then finish there, or receive further help from JD to narrow down the options available. If they accept JDs offer to choose between the options, they are then asked for their desired method of purchasing the vehicle. This is another feature implemented because of the interviews, as Greg mentioned, ‘you need to know how they are going to pay for it, so you can try and find them the best deal’. Once the customer has specified how they will pay for the vehicle, they are asked about budget, another very important question to ask according to the interview participants. The if statement in figure 22 shows how, if a customer chooses to pay cash, they are asked for their budget.

```javascript
if ($response == "pay cash")
  :CashBudgetHatchback
  SayEZWWait("Okay. How much do you plan on spending on a car?")
```

Figure 20: If statement to determine vehicle size

Figure 21: If statement to determine vehicle size

Figure 22: If statement to determine customer payment method
Likewise, the ELSE if statement in figure 23 shows if the customer chooses to lease the vehicle, they are asked for their lease budget.

```
ELSEif (response = "take out a lease")
  :LeaseBudget Hatchback
  SayESDWait("Okay. How much do you plan on spending each month on a car?")
```

*Figure 23: If statement to determine customer payment method*

Depending on the customer’s response to budget, JD will tell them the vehicles in their price range. Should they wish to hear more information about the vehicle, and ask specific questions regarding facts such as top speed, 0-60, etc. they can simply ask JD.

### 6.4 Detailing a Specific Vehicle

Given the limited time and budget for the study, it would be impossible to create a fully functioning robot containing every piece of data and information associated with every vehicle in a vehicle showroom. Therefore, for the prototype, JD was programmed to answer the question ‘how much is the Vauxhall Corsa’ in order to demonstrate its ability. Figure 24 is a flow chart which outlines this very process. Although JD can explain every model in the Vauxhall Corsa range, the flow chart focused specifically on the Vauxhall Corsa Sting, for the example.
First, JD starts by giving a base model price for the Vauxhall Corsa. As Robert explained in the interview, some people know ‘that the big sticker isn’t always the price of that vehicle but the starting price for that model’. It was an important feature to include in JD’s design that it specified the base model price and then asked the customer which specific model they were referring to, as shown in figure 25 below.

![Flow chart showing customer conversation with JD](image)

Figure 24: Flow chart showing customer conversation with JD

Figure 25: JD querying the model the customer is referring to

Once the customer specifies a model to JD, it then in turn gives the exact price that the customer is looking for. As well as giving the information to the customer, JD is always providing feedback. During the interviews, the researcher asked Robert if they believed it
would be a valuable feature for the robot to give feedback to the customer, such as replying ‘great choice’ when they specify a model. Robert explained that ‘little things like that make a customer more eager’. That is exactly what JD does, when the customer chooses a model, JD replies ‘great choice’, as shown in Figure 26.

```
ControlCommand("Auto Position", AutoPositionAction, "Point")
SayE2BWait("A great choice! The Sting is a sporty and spacious car.")
```

Figure 26: JD providing feedback to engage the customer

Rather than leaving it at that, JD proceeds to offer the customer further information on the vehicle, such as its appearance. If the customer accepts to hear this information, they then are invited to ask JD specific questions about the vehicle such as fuel efficiency, power or road tax. This was an important feature to implement in the design of JD, as 4 out of the 5 interview participants pointed out that being asked basic questions like these were an extremely common part of the job, with Lewis explaining ‘most queries you tend to get are about simple stuff... what engine sizes are available, power, [and] fuel economy’.

### 6.5 Service Deal Information

Working out prices for service deals only requires a vehicle model, engine size, and fuel type. JD was programmed with the ability to take in this information and use it to search for the appropriate prices for a service according to the customers specified vehicle. Figure 27 is a flow chart which outlines a scenario where a customer has a 1 litre, petrol engine, Vauxhall Corsa.
Figure 27: Flow chart detailing the steps to give a customer a price on a service deal
First, JD requests the model of the vehicle from the customer. Once it has received a response, JD will always repeat the customer’s response as shown in figure 28, and ask them to confirm whether it is correct or whether they would like to change.

If the customer changes their decision, they will have the previous question repeated to them so they can make a new choice. Once a model has been chosen, the customer will be asked what size engine the vehicle has. Again, they will be asked to confirm their choice. And finally, the customer will be asked the fuel type of their specific vehicle. Once JD has received the answer to these questions, it will be able to relay the service deal information, such as price and monthly payments, to the customer. Figure 29 gives an idea of what a typical response looks something.

During the interviews, Mary explained that a service plan is a monthly subscription a customer can pay and for that you get, as a bare minimum, an annual service consisting of oil change, vehicle health check, and various filter changes. But they can also include air con refills, and discounts off things such as MOTs.

So, once a customer has been given their specific service plan information, JD will offer them an annual half price MOT, common practise for Vauxhall dealerships. Should the customer choose to accept the offer, JD will repeat the service deal information to the customer with a new, updated price, as shown in figure 30.
6.6 Missing Features and Enhancements

The researcher can wholeheartedly conclude that the concept of the prototype robot was a success. The features which the JD robot was implemented with work well, as has been demonstrated through the video found in the appendix. In order to become a fully functioning sales assistant robot however, there are a few missing features which would be of use. A useful but missing feature for this prototype would be the ability to compare 2 vehicles for a customer by identifying strengths and limitations of each, and maybe comparing specifications like fuel economy etc. Perhaps the main missing feature of the prototype was the inclusion of emotion intelligence into the robot’s design. As already discussed in various chapters of this study, this feature was overlooked as the participants interviewed did not feel it would add sufficient value to the robot. This is something which would be interesting to look at, however would require further research into emotion intelligence, along with an entirely new primary research project. This is something which could possibly be looked at in future projects.

For system enhancements, adding the full vehicle details for every vehicle available in a showroom would be a definite feature to consider. This would enhance the system to discuss and talk about all sorts of vehicles and give far greater information to customers. A major enhancement of the system would be to store the information on a database, like a MySQL database, where the robot could retrieve information from when being asked questions or asking questions, rather than hard coding all possible responses and vehicle information into the main body of code for the system.
Chapter 7: Conclusion

The conclusion will first provide a brief overview of the project’s initial objectives and will detail if and how these objectives were met. A recommendation for future work will also be included in this chapter which will aim to outline any elements of the research which should be changed in future to increase the value of the research. Any contributions to existing knowledge will be outlined before a brief paragraph of self-reflection will be drawn up to identify how the research has affected myself as an academic.

7.1 Aims and Objectives

7.1.1 Secondary Research

The first objective of this research project was to evaluate existing literature sources relating to robots in various industries and professions through secondary research such as books, journals, and articles. There was a rich variety of material available discussing research into many different robots and their applications. Learning about these various robots and comparing how and where they have been used gave an in-depth understanding of how the current field of robotics is being utilised, and more importantly for this project, outlined an area where robots have not been and could be used – the care sales profession. Further, the literature review also gave an insight into the current research area of emotion intelligence in robotics and helped to give a better understanding of how this feature can and has been utilised.

7.1.2 Primary Research

The second objective of the research project was to perform primary research to gather first-hand data from relevant individuals. The primary research was undertaken using semi-structured interviews and was used to determine participants views towards a number of questions. The interviews were set up to gain valuable insights from participants concerning their opinions on the most common and important questions they get asked and ask. They were also important to provide useful feedback from the participants regarding their views towards emotion intelligence in robots. Finally, the interviews determined employee views towards firstly the value a robot could add to the profession, and secondly their own opinions on the idea.

7.1.3 Identify Primary Research Findings

The third objective of this research project was to discuss and analyse the findings from the primary data collection and identify key findings. The knowledge gained from the interviews was evaluated in the conclusion of the results chapter. Participants gave plenty of insight into what questions they get asked and ask customers which enabled the research to outline a number of key requirements the robot must adhere to which were subsequently used to flesh out the design of the robot. Also, the interviews provided valuable feedback concerning participant views towards emotion intelligence, and as a result of their opinions, swayed the researcher’s decision not to implement emotion intelligence in the robot’s design. Finally, it was also interesting to discover participants views towards robots in the workplace which were also discussed in the results chapters conclusion.
7.1.4 Designing and Building the Prototype
Before building started, some flow charts were created identifying how the robot should ideally communicate with customers and run through its processes.

The prototype was developed using an EZ-Robotics JD robot and was coded using the EZ-Script language. The robot was coded with a number of features including giving information on vehicles, helping customers choose vehicles, and helping to build custom service plans which were all concluded as important features in the results chapter conclusion. As well as having the basic chatbot features, JD was also programmed to gesture and move to come across more natural.

Once the JD robot was developed and implemented with all the necessary features, it was tested running through the various features it could handle. It handled these successfully and the results were filmed and included in the appendices. Any features which were missing or could be enhanced were also detailed in the implementation section.

7.2 Limitations
Given the relatively small window given to complete this project, the prototype robot was only given basic functionality and this was evident in the testing of JD. Although it covered the key features identified from the interview participants, its knowledge compared to that of a human car salesperson was limited. Further, it did not contain a full range of gestures and movements throughout its full cycle as can be seen from the video. Although this did not have a detrimental effect on the overall study, it is definitely an area of the research which could have been improved upon. The depth of the study was also limited due to the small sample used for data collection, and limiting the data collection method to just one collection method i.e. interviews. As a result of this, although of great value to the project, the data collected was not as high quality as initially hoped for.

7.3 Future Work
If the research were to be carried out further, the author would recommend firstly choosing a primary research audience of a larger size, and from a larger demographic. This was already outlined in the limitations section of the methodology, but is important to re-emphasize because it is vital to gain as much primary knowledge as possible from a large audience, and being able to spread that audience out across a larger geographic location either nationally or internationally, will make for considerably more accurate and concrete findings. The author would also recommend a combination of both interview and questionnaire collection techniques to be used if this research were to be carried out further. It is possible to easily gain a far larger sample through the use of questionnaires and would be useful as a means of supporting the interview results and vice versa. Although the JD robot was more than capable of performing the tasks at hand, the author would recommend using a more advanced robot such as the Nao robot for future exploration into this study area. As mentioned in the literature review, the Nao robot would be the most appropriate robot for the task of being a car sales assistant and offers all the necessary features, such as voice recognition and facial detection. Finally, further and more in-depth research would be carried out into the field of emotion intelligence, as discussed in the missing features and enhancements section, to
better understand its strengths and limitations, and how it could be of use to the project of robots in the automobile sales profession.

7.4 Contributions
This paper has filled a gap in existing literature, as until now, no other research paper has been conducted into the possibility of robots in the automobile sales profession. Furthermore, by producing a prototype robot which already has basic functionality capable of assisting sales personnel in the automobile sales profession, a new line of investigation could potentially have opened up to create better, more advanced prototype robots of this nature such as the implementation of emotion intelligence features. This research project is unique in that it hasn’t been covered previously in any sort of literature, but builds on the ideas laid out by the Honda Motor Company, as discussed in the literature review, which detailed a salesperson robot to explain features of vehicles to potential buyers with access to a database of information for both customers and products as well as a camera which could detect human faces, and has turned their idea into a physical working prototype. This research has definitely gone some way to explore the possibilities of introducing robots into the automobile sales profession.
Chapter 8: Bibliography

Chapter 9: Appendices
Appendix A: Interview Transcripts
Participant 1

INTERVIEW

PARTICIPANT 1 - John

Transcribed 08/04/2018

Interviewer: Can you confirm that you’re okay with me using my phone to record this interview?

Interviewer: Yeah sure

Interviewer: Thank you, and you’ve signed the consent form to confirm your happy to be interviewed?

Interviewer: Of course

Interviewer: Great let’s start. Can I start by asking how many years have you worked as a car sales person?

Interviewee: Ohh it’s got to be getting on for err (pause) 2 years something like that I think

Interviewer: Uh-hm, and what sort of level are you at within the profession if you don’t mind me asking? In terms of like salesperson, sales manager that sort of thing?

Interviewee: Oh, just a salesperson

Interviewer: Okay then. So as a salesperson, what common questions do you get asked by customers daily?

Interviewee: Err (pause) we tend to get people who either know what it is they want and have just come in to buy it or they want us to help them decide by a process of sort of finding what best suits their needs you know? I think if they know what their after it just tends to be a case of them talking about money really, everyone wants to lease nowadays so asking questions about lease prices on particular cars or what’s the best lease deal err you know just money and stuff

Interviewer: Yeah so, you’d say money is a common talking point?

Interviewee: Oh, obviously you’ll always get asked about price, like I say for leasing but we obviously still do get people asking about purchase pricing too err just because leasing is so popular doesn’t mean we don’t have cash buyers too err and the same goes for them they want to ask about best prices we got on our cars and all that sort of stuff
Interviewer: Uh-hm, any other questions spring to mind? They don’t have to be specific just general question areas too

Interviewee: Err I suppose people ask a lot about perks, like if they know what their after and they’ve chosen what they want they then want to find out about what addons they can have with it

Interviewer: Uh-hm, can you just explain a little what you mean by perks?

Interviewee: Yeah like asking for extras to try and make the deal a bit better. We usually do stuff like, hmm, (pause) like extended warranties and service plans, you know? And free road tax or insurance

Interviewer: I see. So, what if the customer is open minded? You say they either know what they want or its up to you to help choose, what will they tend to ask you?

Interviewee: Err, they tend to ask more basic questions really like how much does this car cost? And then stuff like what’s the MPG? What engine options are available? Basically, the questions could be answered by just looking at the plaques next to the cars but people still end up asking

Interviewer: Plaques?

Interviewee: Actually, I suppose more like a stand, err not a plaque, you know they appear next to all the cars? There’s this sheet of paper with tonnes of information about the particular car err name of the car, price, trim options, (long pause) loads of information, power, engine size, all that sort of stuff

Interviewer: Okay great, do you think then that the repetitive aspect of the job like when you get asked these repetitive questions that we’ve discussed, could err (pause) they be perhaps answered by a robot, like a chat bot would do?

Interviewee: Sure, I don’t see why not, there’s only so many questions you can get asked

Interviewer: Uh-hm, so next then, what are the questions which you find you ask customers on a regular, day-to-day basis?

Interviewee: Definitely the most important question, and err I think definitely common too, is asking what is the purpose of their visit you know? Without knowing this first then I think it would err be quite difficult to properly help someone out without being a mind reader

Interviewer: Uh-hm

Interviewee: Then I suppose I’d ask if they wanted to buy or lease the vehicle err (pause) and probably their budget too I think

Interviewer: Again, money is an important subject then? And common?
Interviewee: Well I guess it has to be because I can’t show them a 30-grand car if they only got 10 to spend (laughs)

Interviewer: Good point. So, you know their budget, how do you go about narrowing it down?

Interviewee: The common ones are things like asking like how many are in the family because err then you know like what size car they will need. Err I suppose you may want to know things like the age of the family as well you know? A small engine will struggle with a group of large adults

Interviewer: Uh-hm makes sense. Any others?

Interviewee: Err (pause) there’s lots but I can’t think sorry (pause) I think those are the most frequent questions though. I guess I would ask if there are any particular models they are interested in so I know if they have something in mind first before taking them on a tour of the entire showroom

Interviewer: Great, and so do you think a robot could handle those sorts of questions?

Interviewee: Yeah like a chat bot they do the same thing, don’t they? They just ask questions and err help I suppose and err I guess it’s the same thing if it knows a set thing of questions to ask like a chat bot then yeah it could work

Interviewer: Uh-hm good that covers that. So, I’d like to just ask you if your familiar with the term emotional intelligence?

Interviewee: No not really, like I’ve heard of it but I couldn’t explain it

Interviewer: That’s okay, essentially, it’s the ability to understand someone’s emotions and act accordingly. So, err for example (pause) if someone’s sad, you pick up on it and adjust your mood and attitude accordingly

Interviewee: Okay

Interviewer: Do you think this would be a useful feature to include in a robot? Let’s say a customer’s unhappy with err their service that umm the robots giving them, so the robot err acknowledges this and asks what is wrong

Interviewee: Err I’m not sure to be honest I think a robot is a robot and err if someone’s not happy then a robot won’t be able to really help I suppose and I think if it’s a robot that’s made the customer unhappy then no the robot asking what’s wrong will just make them err irate

Interviewer: Uh-hm. So, finally then, would you say a robot assistant can add value in your line of work?
Interviewee: Err yeah, I believe it could definitely help in some cases like we do get very busy days where your just rushed off your feet with err so many tyre kickers and time wasters that take up a load of time and err if it could take care of them that would be something

Interviewer: Uh-hm, so what are your views towards maybe having a robot in the workplace?

Interviewee: I think it would be alright yeah err I think it would definitely get used by the customers its something new something err a little modern and whatever and yeah like I say I think there’s areas where it could help us out

Interviewer: Okay thanks we’re all done
Participant 2

INTERVIEW

PARTICIPANT 2 - Greg

Transcribed 08/04/2018

Interviewer: Right then, could you just confirm that you’re happy for this interview to be recorded?

Interviewee: Yeah yeah, yeah, no problem

Interviewer: And you’ve signed and read the consent form?

Interviewee: I have indeed

Interviewer: Great then let’s start, do you mind me first asking how many years of experience do you have in the profession? And what level are you at err manager or salesperson etc

Interviewee: Umm I’ve done this for 5 years give or take and I’m a regular salesperson

Interviewer: Perfect, that’s the background questions out the way then. Can I ask what questions you umm (pause) you ask no sorry you get asked by customers on a daily basis?

Interviewee: Hmm (pause) well one of the biggest problems with being a salesperson is that err people are always out for a bargain and you spend your day with people who always try to beat you down on price you know their never happy to settle. So, I suppose being asked umm stuff like (pause) ahh think man umm you know can you do any better? Or, how low will you go on it?

Interviewer: Okay so bargaining questions are common?

Interviewee: Yeah

Interviewer: What else?

Interviewee: Can you throw some goodies into the deal? You know like a set of floor mats or boot tray all things like that always get asked for because typically that’s err what people tend to ask when your very close on closing the deal (pause) and that’s a lot of money people are committing too there so umm you know they want to make sure they get umm get as much as they can when their parting with all that err hard earned money you know?

Interviewer: Sure. So, if these are the particularly repetitive questions umm like the common ones you get asked, do you think that a robot could err I suppose assist with answering these questions?

Interviewee: Umm yeah, I think it could but not always
Interviewer: When do you think it could then?

Interviewee: Well with answering the simple questions like err about how much a car is or (pause) colours and stuff then it could answer those easily but umm not you know what did you say err (pause) bargaining questions

Interviewer: Okay interesting, why’s that then?

Interviewee: Err well I can’t even offer a deal to someone or umm you know a discount unless my manager gives the go ahead and it’s not like there’s a specific amount you can discount off something you know every car is different and err every customer is different so I really don’t think that that is something it could do it has to be done by a manager

Interviewer: Uh-hm. So next, (pause) if I can find it err, (long pause) right, what questions do you ask customers on a regular, day-to-day basis?

Interviewee: I always ask the customer’s name, that’s what all salesman do, and if they don’t they’re not a good salesman. You need to show you have an interest in them and get a bit of a personal relationship on the go. (pause) Then it’s about digging deeper into their needs. I always ask why they want to buy a new car, it gives clues to what I can offer them you see? I mean, if they say they need more space, for example, you obviously know to avoid the small hatchbacks.

Interviewer: Sure

Interviewee: Then you can ask more questions to further get a better picture (pause) will you be doing a lot of mileage in the vehicle? Obviously, you want a diesel then. Will you be towing trailers or a caravan? Then I’m not gunna show them around the Corsa’s am I you know? (laughs). Err I guess you could say its kind of like umm a checklist that you go through ticking off each thing you know

Interviewer: Okay, so once you know what the customer is after err let’s say they've made a choice, what are the next steps?

Interviewee: Err then I guess you turn your attention to money that’s a biggy you know you need to know how they are going to pay for it, so you can try and find them the best deal (pause) but like you need to ask if they will be paying cash or finance too you know? Like err because if they wanna finance, you need to know how much they can afford to spend each month and err same for cash you need to know their budget

Interviewer: Uh-hm (pause) asking for payment method and budget is a common topic then?

Interviewee: I mean (pause) if they’re a umm serious customer and lets say they are going to buy a car then yeah its umm asked every time you would never you know (pause) not ask someone that if they wanted to buy (pause) it’s the main question

Interviewer: You think these questions could be handled by a robot?
Interviewer: Oh yeah, their easy ones err you actually repeat yourself a lot with those questions you know and they’re not difficult like you know how much can you spend? That’s not difficult I don’t think anyway.

Interviewer: Can I ask now then if your familiar with the term emotional intelligence?

Interviewee: Umm (pause) no but I guess its just being err intelligent to emotions I guess I dunno aha.

Interviewer: That’s fine, its quite easy it’s the idea that you can understand someone’s current emotion and adapt appropriately to it. For example, err if someone’s sad you would change your mood accordingly and perhaps question them and ask if they’re okay and what’s wrong.

Interviewee: Right.

Interviewer: Do you think these would be useful features on a robot?

Interviewee: Umm (pause) it might be a bit naff don’t you think? You know I won’t argue robots can be intelligent I’m not gunna like deny that you know but emotions (pause) in a robot (pause) no robots don’t have emotion and I would put money on it umm (pause) no I don’t think a robot ever needs to understand if I’m sad to be honest err like what’s it going too do about it even if I was you know its not useful in my opinion no.

Interviewer: Fair enough, okay, err moving on then what do you think about a sales assistant robot? Umm so like firstly do you think it could add value to your profession?

Interviewee: Umm (long pause) I think it’s useful for customers just having a browse you know? Perhaps if you could maybe have err one based at each car (pause) it could give a general introduction to that car and then customers could query it and umm ask the price and colour options and that sort of stuff you know I think that is where umm yeah it could be useful.

Interviewer: I see, so very much like a chat bot?

Interviewee: Uh-hm.

Interviewer: Cool, but now what do you think about a robot in the workplace? Would you like it? What are your views?

Interviewee: Nah not me sorry mate I’ve never liked the idea of robots taking jobs, especially in lower skilled jobs like mine you know (pause) I saw a robot on the news having a full on conversation with the presenters like (pause) I just think the job cuts will start coming along and you know like err if I were a customer I’d wanna you know talk to someone not a robot, as I say it would have its uses but umm I suppose that’s why I don’t like the idea.

Interviewer: Uh-hm. Well thank you I’m all done now so you’re free.
Participant 3

INTERVIEW

PARTICIPANT 3 - Mary

Transcribed 08/04/2018

Interviewer: First and foremost are you happy for me to record this interview?

Interviewee: Sure

Interviewer: And have you read and signed the participant consent sheet?

Interviewee: Yeah

Interviewer: Awesome. Can I ask how many years of experience you have in your role?

Interviewee: Hmm well I've been a sales manager for just over a year I think err yeah, a year last December but err I've worked in car sales since 2006 so about 12 years in the industry in total

Interviewer: Lovely lets umm move on to the real questions then starting with the questions you get asked by customers, umm can I ask what are the most common questions you are asked by customers on a regular basis?

Interviewee: Umm well as a sales manager now I don't really get involved (pause) directly with the sales making any more I mostly spend my time really running the team and stuff like that (pause) but umm I did do it for a long time so I know just as well as anyone what the customers want to umm know and ask. (pause) I think it's important to note firstly that umm a lot of the people who walk into the showroom tend to be browsing you know? They often umm will explain how they err may be coming into some money or that they may be considering getting a new car so (pause) really people will just want an idea of what is on offer to them you know? They won't have too many specific err questions or queries to ask they just want some information

Interviewer: Uh-hm

Interviewee: Umm price is always a common question as I'm sure you can imagine, I mean (pause) we are in the sales industry after all so you are going to expect one of the umm most common questions I guess to be about the price of what we are selling

Interviewer: Uh-hm

Interviewee: Very rudimentary questions tend to be common too so umm questions like what are the different engine sizes available? How many doors? (pause) What is it like on fuel?
Interviewer: Sure, that’s something which others have mentioned too

Interviewee: Yeah, I’d have thought so. Umm another question which I myself am asked an awful lot is from people wanting to err find out what plans we can do with the cars too (pause) and because umm we are basically competing with other garages and dealers we need to try and you know make sure our plans are better than anyone else’s

Interviewer: So, umm by plan you mean a service plan? Like err an annual oil change or something?

Interviewee: Umm well that depends entirely on the plan, but you are on the right lines. Basically, a service plan is a monthly subscription a customer can pay and for that you get, as a bare minimum, an annual service consisting of oil change, (pause) err vehicle health check, and various filter changes. (long pause) But they can also include air con refills and stuff like discounts off things such as MOTs

Interviewer: Uh-hm. Do you think these questions could be dealt with by a robot assistant?

Interviewee: Hmm (long pause) yeah (pause) I think so

Interviewer: Okay. So next then, what questions do you ask on a regular daily basis?

Interviewee: Hmm (pause) well as I say, most people don’t have a clue what they’re after when they visit the showroom so it’s up to us as sales people to help them understand what they want and need. I think firstly you need to find out if they are looking to purchase the vehicle outright or if they want to pay for it through finance or even just lease the vehicle for a certain period. (pause) Not every vehicle we have is eligible for all 3 of those options. So, err, before I can even think about offering someone a test drive in something then umm I guess I need to know if it’s even possible for them to have the car. (pause) But that’s another common question which you umm find yourself asking customers, do they want to test drive the vehicle? Sometimes, the best way to sell is let the car do the talking. (pause) Sometimes, simply showing someone a car doesn’t always you know (pause) err excite them, you may need to give them a gentle nudge towards wanting to buy it.

Interviewer: Great, any more you might ask?

Interviewee: Umm (long pause) well the most common questions I suppose are about asking what it is exactly the customer wants from their new car things like umm (pause) how many seats do you need? What body-type are you looking for? There’s so many questions you need to ask in order to get the best idea of what the customer wants

Interviewer: That’s perfect. So, do you think a robot could ask these questions in order to help a customer choose and narrow down their options?

Interviewee: (pause) Yeah it would definitely be helpful in that regard, err if you have a customer who is open minded then I think running through a series of umm criteria you know like questions about number of seats and body type and umm (pause) you know then yeah it could help customers make their decisions
Interviewer: Uh-hm. Can I ask are you familiar with the term emotional intelligence

Interviewee: Err (pause) I think I may have heard of it but no I couldn’t define it

Interviewer: It’s essentially the ability to detect someone emotion and act accordingly, err if someone’s sad you pick up on it and umm then you (pause) you act appropriately to that person’s mood you know basically how we as humans work if like umm we see someone is sad we ask them why are you sad you know? We pick up on these things. Do you think this ability would be useful in a robot assistant?

Interviewee: Err but how would a robot comprehend emotion and detect that?

Interviewer: Umm (pause) there are features such as emotion detection which enables a robot to detect if someone is smiling or frowning, this is what the robot I am using has as a feature

Interviewee: Hmm (pause) I don’t really see how this would be that beneficial to be honest like err what’s it supposed to achieve just ask someone why they’re frowning? (pause) I think just doing its job answering questions is probably umm sufficient

Interviewer: I understand your point it makes a lot of sense. So, do you think a sales assistant robot can add value to your profession? And what are your opinions towards it?

Interviewee: I think definitely it could play a role in the business, I can see it working but I think it’s something you would see maybe in the showrooms of China or Japan rather than Wales and Britain, but we’ll see (pause) But I’m definitely all for the idea myself for sure err we can be very busy sometimes, really rushed off your feet busy, so something umm to take the pressure off would be welcomed with open arms (laughs)

Interviewer: Alrighty that’s everything I need to know
Interviewee: Hmm (pause) I think customers tend to come in to a dealership because they need help, so err often they just want to get an idea of what’s on offer I suppose (pause) I think in that case the most common question would be asking what deals we have I think yeah like if someone comes in and they don’t have a clue what they want and err they don’t have a specific car in mind then I think they’re open to sort of hearing what we have to offer them you know?

Interviewer: That's a good point, any others?

Interviewee: Yeah umm (pause) I suppose I do quite often get asked what car I would recommend especially from old people and just umm those who generally don’t either have much clue about cars or who err you know don’t care and they just want something that’s gunna get them from a to b

Interviewee: Sure, I get asked all the time what car would I recommend. Some people really don’t know a great deal about cars, so they ask me what I would have to try and influence the decision
Interviewer: So, correct me if I’m wrong, but it seems that umm mostly that customers tend to have a limited knowledge so the questions they ask are quite simple too?

Interviewee: Umm (pause) when talking about the vehicles yes, most queries you tend to get are about simple stuff, hmm (long pause) like what engine sizes are available err power, fuel economy err (pause) and all those types of questions

Interviewer: Okay that’s good, so you say the questions about the vehicles are basic and simple, what does that leave?

Interviewee: What do you mean?

Interviewer: Sorry I’m struggling to say it in a way that makes sense (laughs) like, what are difficult questions then if those are the easy ones?

Interviewee: Oh, I get you, those would be like the money questions umm trade in values and umm extra costs and stuff

Interviewer: Right got there in the end (laughs). So, if you had a robot in the showroom, do you think it could assist with answering these kinds of questions?

Interviewee: Umm (long pause) I’m sure it could definitely handle most questions but umm like I say I do have people who say what would you recommend and err I mostly base that decision on umm my own judgement and umm what I feel they might want just from looking at them if you see what I mean. But a robot probably couldn’t do that I don’t think to be honest but you know most questions have a umm set answer I suppose I mean like there’s no sort of judgement or err too much thinking that goes into it you know if someone says what colours does a Corsa come in then it’s a set answer like umm you know it’s just red, blue, green or whatever a robot could answer that stuff easy

Interviewer: Uh-hm. Next then, what common questions do you ask customers on a regular, day-to-day basis?

Interviewee: A greeting tends to come first, but in terms of questions I suppose I would ask them what can I do for you today? Or umm how can I help you today? Yeah, I think those are the key questions to get the ball rolling you know? But umm (pause) yeah from then on it really depends on the customers response to that like

Interviewer: Uh-hm

Interviewee: I mean, if they wanna buy a car then I’d ask a few questions to umm get an idea of the sorts of err things they need and I can sort of umm get an idea of what to suggest to them yeah so asking like who will it be for? What will it be used for? This gives me a rough idea of what I should and shouldn’t suggest to them.

Interviewer: So how will you narrow this down more?
Interviewee: Just asking them what features they want they need really umm (pause) is 4-wheel drive important, do they want a 2 door or 4 doors, (pause) sunroof (pause) you get the idea and then you should know exactly what to offer them and then you can talk money

Interviewer: Go on?

Interviewee: Err (pause) so basically with money questions there are a few common ones to ask like are they buying or leasing a car because if they want to buy a car then its umm important to know if they are going to want to like umm trade in their old car and then we have to work out a new price with the price of their old car taken off it and err (pause) stuff like their budget so you know what they can afford to spend on a car and that works for leasing as well really I suppose because they have a budget for leasing and buying don’t they so yeah budget is there too

Interviewer: Okay. Similar to before then, do you think a robot could ask these questions to customers and help them for example choose a car?

Interviewee: Yeah just ask the questions in the right order until you’ve reduced the options

Interviewer: Uh-hm. Can I ask you what your knowledge of emotional intelligence is?

Interviewee: Umm (pause) it’s like being able to like cheer someone up or calm them down isn’t it? Like being able to tell if they need cheering up or calming down? I think it’s like umm something to do with psychology, right?

Interviewer: Yeah that’s on the same lines as what I was thinking, umm do you think that having that feature is useful in a robot?

Interviewee: Yeah it could be umm like it could detect if someone was unhappy and maybe alert a staff member or something

Interviewer: Interesting, okay finally then what do you think about a robot in the workplace? Firstly, do you think it could add value and secondly umm (pause) what are your views towards a robot in your showroom?

Interviewee: No offence, but no (laughs) I just can’t imagine it would be received well by the customers, I feel they would prefer to talk to a human (pause) but it all comes down to the individual I suppose like if you asked a hundred customers you may get very different answers, but my answer is no

Interviewer: What if the robot could hold a conversation with the customer, like a natural flowing conversation? Do you think it would be received well then?

Interviewee: I just can’t imagine it would really be that natural, nothing like a person anyway

Interviewer: Okay that’s all my questions, thank you
Interviewer: Right can I first of all just make sure your happy for this conversation to be recorded?

Interviewee: No, I don’t mind

Interviewer: You’ve signed the consent form too?

Interviewee: Yeah, I have

Interviewer: So, I have just 2 small questions to get a bit of background information, firstly how many years of experience do you have and what role do you have within the profession?

Interviewee: Umm I started last June so approaching a year and my role is a car salesperson

Interviewer: Great. Could you tell me what are the common questions you get asked on a day-to-day basis by customers entering the showroom?

Interviewee: Umm price is always the top question you get asked a salesperson you know like the price of the car or err the price of the lease umm the price of the deposit anything concerning price which is funny because err the cars usually have some sort of sticker or information sheet which clearly tells you the price but I just think nowadays some people are a bit more savvy and know that the big sticker isn’t always the price of that vehicle but the starting price for that model they. Umm so yeah getting asked about the cars starting price or base model price and err then being asked what is the price of the one they’re umm looking at too that’s another lot of questions

Interviewer: Another participant mentioned an information sheet too in their interview umm is it the one with all the basic information like horse power and miles per gallon, right?

Interviewee: Yeah, tax price and insurance group, those sorts of facts

Interviewer: Would you many of the questions customers ask can be answered with the information sheet?

Interviewee: I think it’s enough to answer most customers questions yes, people like to get an idea of our offerings and the stuff on the sheet probably enough to give them the information they need yeah (pause). Most of the time they’re only coming in for a look around anyways err a lot of people will be like oh yeah, we’re just looking around or they’re looking around umm a few other showrooms first
Interviewer: Okay. So what else might people ask you, or does that just about cover it?

Interviewee: There’s loads more questions they won’t all be covered in one interview there’s just too many but the one I’ve told you are the most common in my opinion like the most common questions that I would get asked yeah. Particularly with the younger buyers we do get asked if a vehicle comes with any free insurance. Does it come with a warranty? Is servicing included in the price? Those are common questions too I would say.

Interviewer: Uh-hm. So, do you think a robot could assist with these answering these questions?

Interviewee: (pause) well I think it would be capable apart from questions where you require human intervention like if a customer asked for a test drive or something then a robot couldn’t authorise that you need a member of staff to umm check for a driver’s license and sit in the vehicle when it’s being taken for a test drive

Interviewer: Okay thank you. Next then, what common questions do you ask customers?

Interviewee: Umm (pause) I’m still relatively new to the job so I still use something called car sales qualifying inquiries which I found in a book my boss gave me which are I suppose umm like the fundamentals of sales like you know the questions a sales person should always ask and the first step is to always introduce yourself and ask the customer for their name (pause). Then it’s about umm trying to determine what you should show the customer like what car you should offer them and which ones won’t be appropriate and I mean you can do this pretty easily with some basic questions like what type of car are you after you know do you want an SUV or a hatchback and umm like how many people will you need to carry in the car these are all simple questions which umm easily enable you to narrow the options down. (long pause) And if they well be umm towing anything like a caravan that’s important to note too

Interviewer: Uh-hm

Interviewee: And err once I’ve ticked off my checklist and identified a car then I can offer them a test drive too which is another opportunity to ask the customer questions as well like it’s very comfortable, isn’t it? And it drives lovely, doesn’t it?

Interviewer: No one else has mentioned that

Interviewee: I’ve never known a salesman not do it to be honest with you (pause) it just keeps them talking and hopefully wanting to buy the car, it’s a good way of keeping them interested yeah

Interviewer: So, you’re always trying to encourage the customer to let them know they’ve made a good choice?

Interviewee: Exactly, its psychology (laughs) you make them want it
Interviewer: Aha (laughs), so slightly off topic, would it be a valuable feature if the robot gave feedback, like saying good choice, when a customer specifies a vehicle they want to talk about?

Interviewee: Yeah definitely! Little things like that make a customer more eager

Interviewer: Moving on, can I ask what your understanding of the term emotional intelligence is?

Interviewee: Umm I don’t know anything, sorry

Interviewer: That’s fine not to worry, it’s the idea that you can detect a person’s mood and act accordingly so umm acknowledging if someone’s sad or angry. Do you think this would be useful for a robot to have?

Interviewee: Umm (pause) It could be I’m not really sure

Interviewer: That’s fine, finally then, do you think a robot could add value to your profession? And what are your views and attitudes towards maybe having a robot in your workplace?

Interviewee: Umm yeah, I think it could add value for sure you know we've already said a lot of questions which we get asked can be answered quite easily with the information provided on the sheets by the cars and it’s not really any different to umm you know a chat bot they have them on the website so it’s kind of the same thing really umm I don’t see why a robot couldn’t do the same. (long pause) It would be cool, it could possibly be a way of getting more people through door as well some people have a bit of a fear of us salesmen so they would probably prefer to talk to robot (laughs)

Interviewer: Okay perfect, that’s everything I need
Appendix B: Flow Charts

Flow Chart 1: Asking for help purchasing a car

Part 1
Flow Chart 2: How much is a specific vehicle?
Flow Chart 3: Asking for service deals

Part 1
Appendix C: JD Code

Code Snippet 1: How much is the Vauxhall Corsa?

Code snippet refers only to user requesting information about the Vauxhall Corsa Sting. The full code is about 25 pages long. The full commented code can be viewed here: https://firebasestorage.googleapis.com/v0/b/georgebt-f1af8.appspot.com/o/HowMuchIsTheVauxhallCorsa.txt?alt=media&token=4bfbfc3f-5cfd-4053-a669-0af9e2a862fa

:VERYSTART

ControlCommand("Speech Recognition", pauseOn)
ControlCommand("Auto Position", AutoPositionFrameJump, "Scratch1")
sayEZBWait("The Vauxhall Corsa starts at only ten thousand pounds, which model were you referring to?")
ControlCommand("Auto Position", AutoPositionAction, "Stop")

SayEZBWait("We have the Sting, the Design, the S R I, the Energy, the SE, the Limited Edition, the Elite and the VXR")

ControlCommand("Speech Recognition", pauseOff)
$response = WaitForSpeech(10, "sting", "design", "s r i", "energy", "limited edition", "v x r")
ControlCommand("Speech Recognition", pauseOn)

if ($response = "sting")
    ControlCommand("Auto Position", AutoPositionAction, "Point")
    SayEZBWait("A great choice! The Sting is a sporty and spacious car.")

    ControlCommand("Auto Position", AutoPositionAction, "Stop")

    SayEZBWait("Prices start at eleven thousand pounds. Would you like to hear more about the Sting?")
ControlCommand("Speech Recognition", pauseOff)
$response = WaitForSpeech(10, "yes", "no")
ControlCommand("Speech Recognition", pauseOn)

if ($response = "yes")
    SayEZBWait("There's no mistaking the Sting.")

ControlCommand("Auto Position", AutoPositionFrameJump, "throw mic 1")
SayEZBWait("A pair of white stripes stretch along the bonnet, roof and boot.")

ControlCommand("Auto Position", AutoPositionFrameJump, "throw mic 2")
SayEZBWait("And if that's not enough, there's a set of white alloy wheels you won't find anywhere else in the range.")

ControlCommand("Auto Position", AutoPositionFrameJump, "singing hands in 1")
SayEZBWait("I also know information like fuel efficiency, power, top speed, and lots more")

:START

SayEZBWait("What would you like to hear? You can hear the full list of what I can tell you, ask me something and see if I know it, or just say no thank you")

ControlCommand("Speech Recognition", pauseOff)
$response = WaitForSpeech(10, "full list", "zero to sixty", "tank range", "road tax", "number of seats", "number of doors", "safety information", "fuel efficiency", "power", "top speed", "no thank you")
ControlCommand("Speech Recognition", pauseOn)

if ($response = "full list")
SayEZBWait("I can tell you zero to sixty times, range of a full tank, road tax, number of seats or doors, safety information, fuel efficiency, power, or top speed, .")

goto(START)
ELSEif ($response = "zero to sixty")
  SayEZBWait("Zero to sixty takes 13.2 seconds.")
  goto(START)
ELSEif ($response = "tank range")
  SayEZBWait("A full tank should get you around 548 miles.")
  goto(START)
ELSEif ($response = "road tax")
  SayEZBWait("The Corsa Sting is in the tax band e. This means the annual road tax is 140 pounds.")
  goto(START)
ELSEif ($response = "number of seats")
  SayEZBWait("All Corsa models have 5 seats. 2 in the front, 3 in the back")
  goto(START)
ELSEif ($response = "number of doors")
  SayEZBWait("The Sting comes as a 3 door")
  goto(START)
ELSEif ($response = "safety information")
  SayEZBWait("To be completed")
  goto(START)
ELSEif ($response = "fuel type")
  SayEZBWait("Both engines are unleaded petrol")
  goto(START)
ELSEif ($response = "fuel efficiency")
  SayEZBWait("Both engine options achieve a combined 55 miles per gallon")
  goto(START)
ELSEif ($response = "power")
SayEZBWait("There are two engine types. Both are 1.4 litre, four cylinder engines. One generates 75 brake horse power, while the other has slightly more at 90 brake horse power")
goto(START)
ELSEif ($response = "top speed")
    SayEZBWait("The 75 brake horse power model achieves a top speed of 101 miles per hour. The 90 brake horse power model achieves a top speed of 109 brake horse power")
goto(START)
ELSEif ($response = "no thank you")
    SayEZB("Okay. Just ask if you need anything else")
    ControlCommand("Auto Position", AutoPositionAction, "Bow")
endif

ControlCommand("Speech Recognition", pauseOff)

ELSEif ($response = "no")
    SayEZB("No problem. Just ask if you need anything else")

    ControlCommand("Auto Position", AutoPositionAction, "Bow")
endif

ControlCommand("Speech Recognition", pauseOff)
Code Snippet 2: I want to get a new car

The following code snippet only refers to a customer choosing a lease option for a Vauxhall Viva SE. The full code is around 15 pages long. It can still be viewed here with full commented code:

https://firebasestorage.googleapis.com/v0/b/georgebt-f1af8.appspot.com/o/IWantToGetANewCar.txt?alt=media&token=045ee3eb-ac1e-4b29-a9a6-eb1f4eaa10f8

ControlCommand("Speech Recognition", PauseOn)
ControlCommand("Auto Position", AutoPositionFrameJump, "a1")
SayEZBWait("Well you've come to the right robot")
:START
ControlCommand("Auto Position", AutoPositionFrameJump, "a5")
SayEZBWait("Can I ask a few questions to help assist you?"
ControlCommand("Speech Recognition", PauseOff)
$response = WaitForSpeech(10, "yes", "no")
ControlCommand("Speech Recognition", PauseOn)

if ($response = "yes")
    SayEZBWait("Thank you!")
:StartOfConversationNumberOfSeats
ControlCommand("Auto Position", AutoPositionAction, "Point")
SayEZBWait("First of all, how many people will need to be seated in the vehicle?"
ControlCommand("Auto Position", AutoPositionAction, "Stop")
ControlCommand("Speech Recognition", PauseOff)
$response = WaitForSpeech(10, "one", "two", "three", "four", "five", "six", "seven")
ControlCommand("Speech Recognition", PauseOn)

if ($response = "one" OR $response = "two" OR $response = "three" OR $response = "four" OR $response = "five")
    SayEZBWait("Thank you!")
:StartOfConversationVehicleType
ControlCommand("Auto Position", AutoPositionAction, "Thinking")
Sleep(5000)
SayEZBWait("Would you prefer a hatchback, saloon, m p v, s u v, or a coupe?")
ControlCommand("Speech Recognition", PauseOff)
$response = WaitForSpeech(10, "hatchback", "saloon", "m p v", "s u v", "coupe")
ControlCommand("Speech Recognition", PauseOn)

if ($response = "hatchback" OR $response = "coupe")
    SayEZBWait("Good choice! Economical, stylish and practical, perfect for urban driving! But do you plan on towing a large trailer or caravan?")
    ControlCommand("Speech Recognition", PauseOff)
    $response = WaitForSpeech(10, "yes", "no")
    ControlCommand("Speech Recognition", PauseOn)

    if ($response = "yes")
        SayEZBWait("I wouldn't recommend a small car for towing trailers or caravans, it causes the engine to be put under stress. Would you rather choose a different car or keep your choice?")
        ControlCommand("Speech Recognition", PauseOff)
        $response = WaitForSpeech(10, "choose different car", "keep my choice")

        if ($response = "choose different car")
            SayEZBWait("Okay, one second please")
            Goto(StartOfConversationVehicleType)
        ELSEIf ($response = "keep my choice")
            SayEZBWait("No problem.")
        ELSE
            SayEZBWait("Are you still there?")
        endif
    ControlCommand("Speech Recognition", PauseOn)
ELSEif ($response = "no")

SayEZBWait("Great. We have the Viva, Adam or Corsa.")

:NeedMoreHelpHatchback

SayEZBWait("Do you want help choosing between these options?")

ControlCommand("Speech Recognition", PauseOff)

$response = WaitForSpeech(10, "yes", "no")

ControlCommand("Speech Recognition", PauseOn)

if ($response = "yes")

SayEZBWait("Okay. I'll need to ask you a few more questions. First of all")

:CashorLeaseHatchback

SayEZBWait("Do you want to pay cash for the vehicle or take out a lease plan?")

ControlCommand("Speech Recognition", PauseOff)

$response = WaitForSpeech(10, "pay cash", "take out a lease")

ControlCommand("Speech Recognition", PauseOn)

if ($response = "pay cash")

:CashBudgetHatchback

SayEZBWait("Okay. How much do you plan on spending on a car?")

ControlCommand("Speech Recognition", PauseOn)


ControlCommand("Speech Recognition", PauseOff)

if ($response < 9200)

SayEZBWait("I'm afraid we have no vehicles in your price range")

:IncreaseBudgetOrLeaseHatchback

SayEZBWait("Would you like to increase your budget? Or would you like to check out our lease deals on our hatchbacks?")
ControlCommand("Speech Recognition", PauseOn)
$response = WaitForSpeech(10, "increase budget", "check out lease offers")
ControlCommand("Speech Recognition", PauseOff)

if ($response = "increase budget")
goto(CashBudgetHatchback)
ELSEif ($response = "check out lease offers")
    SayEZBWait("Okay")
goto(LeaseBudgetHatchback)
ELSE
    SayEZBWait("Are you still there?"")
ControlCommand("Speech Recognition", PauseOff)
$response = WaitForSpeech(10, "yes")
ControlCommand("Speech Recognition", PauseOn)

if ($response = "yes")
goto(IncreaseBudgetOrLeaseHatchback)
ELSE
    SayEZBWait("Goodbye")
    ControlCommand("Auto Position", AutoPositionAction, "Stop")
eendif
ControlCommand("Speech Recognition", PauseOff)
eendif
ELSEif ($response >= 9200 AND $response <= 10499)
    SayEZBWait("With your budget, we can offer you the Vauxhall Viva")
ELSEif ($response >= 9200 AND $response < 12599)
    SayEZBWait("With your budget, we can offer you a choice between the Vauxhall Viva and Vauxhall Corsa")
ELSEif ($response >= 12600)
SayEZBWait("With your budget, you can choose between the Vauxhall Viva, Vauxhall Corsa and Vauxhall Adam")

ELSE
    SayEZBWait("Are you still there?")
    ControlCommand("Speech Recognition", PauseOff)
    $response = WaitForSpeech(10, "yes")
    ControlCommand("Speech Recognition", PauseOn)

    if ($response = "yes")
        goto(CashBudgetHatchback)
    ELSE
        SayEZBWait("Goodbye")
    endif
    ControlCommand("Speech Recognition", PauseOff)
ENDIF
ELSEIF ($response = "take out a lease")

:LeaseBudgetHatchback
SayEZBWait("Okay. How much do you plan on spending each month on a car?")
ControlCommand("Speech Recognition", PauseOff)
$response = WaitForSpeech(10, "100", "145", "150", "200", "250", "300", "350")
ControlCommand("Speech Recognition", PauseOn)

if ($response <= 141)
    :IncreaseLeaseBudget
    SayEZBWait("I'm afraid we do not have any vehicles at that budget. Would you like to increase your lease budget?")
    ControlCommand("Speech Recognition", PauseOn)
    $response = WaitForSpeech(10, "increase budget")
    ControlCommand("Speech Recognition", PauseOff)
if ($response = "increase budget")
  goto(LeaseBudgetHatchback)
ELSE
  SayEZBWait("Are you still there?")
  ControlCommand("Speech Recognition", PauseOff)
  $response = WaitForSpeech(10, "yes")
  ControlCommand("Speech Recognition", PauseOn)

  if ($response = "yes")
    goto(IncreaseLeaseBudget)
  ELSE
    SayEZBWait("Goodbye")
  endif
  ControlCommand("Speech Recognition", PauseOff)
endif
ELSEif ($response >= 142 AND $response <= 149)
  SayEZBWait("We can offer you the Vauxhall Viva S E, at a cost of 142 pounds a month")

  :OfferInformationVauxhallVivaSE
  SayEZBWait("I can give you some information about the Vauxhall Viva S E if you like? Or if you're all finished just say no thank you")
  ControlCommand("Speech Recognition", PauseOff)
  $response = WaitForSpeech(10, "yes", "no thank you")
  ControlCommand("Speech Recognition", PauseOn)

  if ($response = "yes")
    ControlCommand("Auto Position", AutoPositionAction, "Point")
SayEZBWait("The Viva S E is a great little car! Smart styling, a generous kit list and low running costs")

ControlCommand("Auto Position", AutoPositionAction, "Stop")

SayEZBWait("And with prices starting at just over 9 thousand pounds, we think its a bargain. Would you like to hear more about the Viva S E?")

ControlCommand("Speech Recognition", pauseOff)

$response = WaitForSpeech(10, "yes", "no")

ControlCommand("Speech Recognition", pauseOn)

if ($response = "yes")

SayEZBWait("It has everything you need, including five doors, five seats, class-leading comfort, ride and handling, together with class-defining assistance technology.")

ControlCommand("Auto Position", AutoPositionFrameJump, "throw mic 1")

SayEZBWait("The car is easy and fun to drive. Excellent road handling with light and responsive steering")

ControlCommand("Auto Position", AutoPositionFrameJump, "throw mic 2")

SayEZBWait("It packs in the features, like rear park assist technology as well as On Star. On Star offers many services, such as in-car access to an advisor 24/7 and 365 days a year and emergency assistance. You can also take advantage of a 4G in-car wi-fi hotspot, which can connect up to seven devices simultaneously.")

ControlCommand("Auto Position", AutoPositionFrameJump, "singing hands in 1")

SayEZBWait("I also know information like fuel efficiency, power, top speed, and lots more")

SayEZBWait("You can hear the full list of what I can tell you, ask me something and see if I know it, or just say no thank you")

:MoreInformation

SayEZBWait("What would you like to hear?")

ControlCommand("Speech Recognition", pauseOff)

$response = WaitForSpeech(10, "full list", "zero to sixty", "tank range", "road tax", "number of seats", "number of doors", "safety information", "fuel efficiency", "power", "top speed", "no thank you")

ControlCommand("Speech Recognition", pauseOn)
if ($response = "full list")
  SayEZBWait("I can tell you zero to sixty times, range of a full tank, road tax, number of seats or doors, safety information, fuel efficiency, power, or top speed, ".")
goto(MoreInformation)
ELSEif ($response = "zero to sixty")
  SayEZBWait("The Vauxhall Viva S E can achieve zero to sixty in 13.1 seconds")
goto(MoreInformation)
ELSEif ($response = "tank range")
  SayEZBWait("A full tank should get you around 400 miles.")
goto(MoreInformation)
ELSEif ($response = "road tax")
  SayEZBWait("The annual road tax is 140 pounds.")
goto(MoreInformation)
ELSEif ($response = "number of seats")
  SayEZBWait("The Viva S E has 5 seats")
goto(MoreInformation)
ELSEif ($response = "number of doors")
  SayEZBWait("The Viva S E comes as a 5 door configuration")
goto(MoreInformation)
ELSEif ($response = "safety information")
  SayEZBWait("To be completed")
goto(MoreInformation)
ELSEif ($response = "fuel type")
  SayEZBWait("The Viva S E is only available as a petrol engine")
goto(MoreInformation)
ELSEif ($response = "fuel efficiency")
  SayEZBWait("The Viva S E can achieve a combined fuel efficiency of 55 miles per gallon")
goto(MoreInformation)
ELSEif ($response = "power")
    SayEZBWait("The 1 litre engine generates 73 brake horse power")
    goto(MoreInformation)
ELSEif ($response = "top speed")
    SayEZBWait("The Viva S E can reach 105 miles per hour")
    goto(MoreInformation)
ELSEif ($response = "no thank you")
    SayEZBWait("Okay. Just ask if you need anything else")
    ControlCommand("Auto Position", AutoPositionAction, "Bow")
endif
ControlCommand("Speech Recognition", pauseOff)
ELSEif ($response = "no")
    SayEZB("No problem. Just ask if you need anything else")
    ControlCommand("Auto Position", AutoPositionAction, "Bow")
endif
ControlCommand("Speech Recognition", pauseOff)
Code Snippet 3: What service plans do you do?

The following code snippet can be found with full comments here:
https://firebasestorage.googleapis.com/v0/b/georgebt-f1af8.appspot.com/o/WhatServicePlansDoYouDo.txt?alt=media&token=3c1b363b-929d-4179-909e-45db448efc4f

ControlCommand("Speech Recognition", PauseOn)
SayEZBWait("I can help build you a bespoke service plan specific to your Vauxhall")
:ChooseCar
SayEZBWait("Can I ask which model Vauxhall you wish to enquire about?")
ControlCommand("Speech Recognition", PauseOff)
$response = WaitForSpeech( 10, "corsa", "viva", "adam", "astra", "insignia", "meriva", "zafira", "mokka", "grandland" )
ControlCommand("Speech Recognition", PauseOn)

if ($response = "corsa")
    :ConfirmModel
SayEZBWait("You wish to enquire about a service plan for a Vauxhall Corsa. Is this correct?")
ControlCommand("Speech Recognition", PauseOff)
$response = WaitForSpeech( 10, "yes", "no" )
ControlCommand("Speech Recognition", PauseOn)

if ($response = "yes")
    SayEZBWait("Great! I have just a few more questions to ask.")
    :VehicleEngine
SayEZBWait("What size is the vehicle's engine?")
ControlCommand("Speech Recognition", PauseOff)
$response = WaitForSpeech( 10, "1 litre", "1.2 litre", "1.3 litre", "1.4 litre", "1.6 litre" )
ControlCommand("Speech Recognition", PauseOn)
if ($response = "1 litre")
  :ConfirmEngineSize
  SayEZBWait("Your vehicle has a one litre engine. Is this correct?")
  ControlCommand("Speech Recognition", PauseOff)
  $response = WaitForSpeech( 10, "yes", "no" )
  ControlCommand("Speech Recognition", PauseOn)
  
if ($response = "yes")
  SayEZBWait("Okay, almost done.")
  :FuelType
  SayEZBWait("Is the vehicle petrol or diesel?")
  ControlCommand("Speech Recognition", PauseOff)
  $response = WaitForSpeech( 10, "petrol", "diesel" )
  ControlCommand("Speech Recognition", PauseOn)
  
if ($response = "petrol")
  :ConfirmEnginePetrol
  SayEZBWait("Your vehicle has a petrol engine. Is this correct?")
  ControlCommand("Speech Recognition", PauseOff)
  $response = WaitForSpeech( 10, "yes", "no" )
  ControlCommand("Speech Recognition", PauseOn)
  
  if ($response = "yes")
    SayEZBWait("That's all I need to know! Thank you for your patience.")
    SayEZBWait("We can offer you a 3 year service plan for your 1 litre Vauxhall Corsa. This is broken up into 3 services either once a year or every 20,000 miles. Each service consists of an oil change, brake fluid change, key fob battery replacement, new oil filter, new pollen filter, and a screen wash re-fill")
    SayEZBWait("This will require an initial payment of £209 up front cost, and then 17 payments of £21.83 to be paid every 2 months until completed.")
SayEZBWait("The total price for this service plan will be £580.80 which works out at £193.60 a year")

:AddServicePlanPetrol

SayEZBWait("As part of our service plans, we also offer a half price MOT, at a cost of £27 a year. Would you like to add this to your plan?")

ControlCommand("Speech Recognition", PauseOff)
$response = WaitForSpeech( 10, "yes", "no" )
ControlCommand("Speech Recognition", PauseOn)

if ($response = "yes")
SayEZBWait("With the MOT added to the service plan, this brings the total price of the service plan up to £665.70 which works out at £221 a year")

SayEZBWait("This requires an initial payment of £282.65, and then 23 payments of £15.35 to be paid until completed

:ConfirmTaskCompletePetrol

SayEZBWait("Is there anything else I can do for you today?")
ControlCommand("Speech Recognition", PauseOff)
$response = WaitForSpeech( 10, "yes", "no" )
ControlCommand("Speech Recognition", PauseOn)

if ($response = "yes")
SayEZBWait("What can I do for you")
ELSEIf ($response = "no")
SayEZBWait("Okay. Have a great day.")
ELSE
SayEZBWait("Are you still there?")
ControlCommand("Speech Recognition", PauseOff)
$response = WaitForSpeech( 10, "yes" )
ControlCommand("Speech Recognition", PauseOn)

if ($response = "yes")
Goto (ConfirmTaskCompletePetrol)

ELSE

SayEZBWait("Goodbye")

ControlCommand("Auto Position", AutoPositionAction, "Stop")

endif

EndIf

ELSEif ($response = "no")

SayEZBWait("Okay no problem")

Goto (ConfirmTaskCompletePetrol)

ELSE

SayEZBWait("Are you still there?")

ControlCommand("Speech Recognition", PauseOff)

$response = WaitForSpeech( 10, "yes" )

ControlCommand("Speech Recognition", PauseOn)

if ($response = "yes")

Goto (AddServicePlanPetrol)

ELSE

SayEZBWait("Goodbye")

ControlCommand("Auto Position", AutoPositionAction, "Stop")

endif

endif

ELSEif ($response = "no")

SayEZBWait("Okay.")

Goto (Okay.)

ELSE

SayEZBWait("Are you still there?")

ControlCommand("Speech Recognition", PauseOff)

$response = WaitForSpeech( 10, "yes" )
ControlCommand("Speech Recognition", PauseOn)

if ($response = "yes")
    Goto (ConfirmEnginePetrol)
ELSE
    SayEZBWait("Goodbye")
    ControlCommand("Auto Position", AutoPositionAction, "Stop")
endif
endif
ELSEif ($response = "diesel")
    :ConfirmEngineDiesel
    SayEZBWait("Your vehicle has a diesel engine. Is this correct?")
    ControlCommand("Speech Recognition", PauseOff)
    $response = WaitForSpeech( 10, "yes", "no" )
    ControlCommand("Speech Recognition", PauseOn)

    if ($response = "yes")
        SayEZBWait("That's all I need to know! Thank you for your patience.")
    ELSEif ($response = "no")
        SayEZBWait("Okay.")
        Goto (FuelType)
    ELSE
        SayEZBWait("Are you still there?")
        ControlCommand("Speech Recognition", PauseOff)
        $response = WaitForSpeech( 10, "yes" )
        ControlCommand("Speech Recognition", PauseOn)

        if ($response = "yes")
            Goto (ConfirmEngineDiesel)
ELSE
    SayEZBWait("Goodbye")
    ControlCommand("Auto Position", AutoPositionAction, "Stop")
endif
endif
ELSE
    SayEZBWait("Are you still there?")
    ControlCommand("Speech Recognition", PauseOff)
    $response = WaitForSpeech( 10, "yes" )
    ControlCommand("Speech Recognition", PauseOn)

    if ($response = "yes")
        Goto (FuelType)
    ELSE
        SayEZBWait("Goodbye")
        ControlCommand("Auto Position", AutoPositionAction, "Stop")
    endif
endif
ELSEif ($response = "no")
    SayEZBWait("Okay.")
    Goto (VehicleEngine)
ELSE
    SayEZBWait("Are you still there?")
    ControlCommand("Speech Recognition", PauseOff)
    $response = WaitForSpeech( 10, "yes" )
    ControlCommand("Speech Recognition", PauseOn)

    if ($response = "yes")
        Goto (ConfirmEngineSize)
ELSE
    SayEZBWait("Goodbye")
    ControlCommand("Auto Position", AutoPositionAction, "Stop")
endif
endif
ELSEIf ($response = "1.2 litre")
    SayEZBWait("To be completed")
ELSEIf ($response = "1.3 litre")
    SayEZBWait("To be completed")
ELSEIf ($response = "1.4 litre")
    SayEZBWait("To be completed")
ELSEIf ($response = "1.6 litre")
    SayEZBWait("To be completed")
ELSE
    SayEZBWait("Are you still there?")
    ControlCommand("Speech Recognition", PauseOff)
    $response = WaitForSpeech( 10, "yes" )
    ControlCommand("Speech Recognition", PauseOn)
endif
if ($response = "yes")
    Goto(VehicleEngine)
ELSE
    SayEZBWait("Goodbye")
    ControlCommand("Auto Position", AutoPositionAction, "Stop")
endif
endif
ELSEIf ($response = "no")
    SayEZBWait("Okay.")
    Goto (ChooseCar)
ELSE
    SayEZBWait("Are you still there?")
    ControlCommand("Speech Recognition", PauseOff)
    $response = WaitForSpeech( 10, "yes" )
    ControlCommand("Speech Recognition", PauseOn)
    
    if ($response = "yes")
        Goto(ConfirmModel)
    ELSE
        SayEZBWait("Goodbye")
        ControlCommand("Auto Position", AutoPositionAction, "Stop")
    endif
endif
ELSEif ($response = "viva")
    SayEZBWait("To be completed")
ELSEif ($response = "adam")
    SayEZBWait("To be completed")
ELSEif ($response = "astra")
    SayEZBWait("To be completed")
ELSEif ($response = "insignia")
    SayEZBWait("To be completed")
ELSEif ($response = "meriva")
    SayEZBWait("To be completed")
ELSEif ($response = "zafira")
    SayEZBWait("To be completed")
ELSEif ($response = "mokka")
    SayEZBWait("To be completed")
ELSEif ($response = "grandland")
    SayEZBWait("To be completed")
ELSE

SayEZBWait("Are you still there?")

ControlCommand("Speech Recognition", PauseOff)

$response = WaitForSpeech(10, "yes")

ControlCommand("Speech Recognition", PauseOn)

if ($response = "yes")
    Goto (ChooseCar)
ELSE
    SayEZBWait("Goodbye")
    ControlCommand("Auto Position", AutoPositionAction, "Stop")
endif
endif
Appendix D: JD Video
Link: https://www.youtube.com/watch?v=XrZhjp-Njos
## Appendix E: Interview Structure

<table>
<thead>
<tr>
<th>Order of semi structured interview</th>
<th>Discussed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Ask respondents approval to use a recording system and confirm they have signed and acknowledged the consent form</td>
<td></td>
</tr>
</tbody>
</table>
| 2) Ask background questions  
Confirm information about:  
- Number of years’ experience  
- Role, level of in job | |
| 3) Discuss questions the participant is asked by customers  
Probes  
- What questions are you regularly asked on a day-to-day basis?  
- Could a robot assist with these tasks? | |
| 4) Discuss questions the participant asks customers  
Probes  
- What questions do you regularly ask on a day-to-day basis?  
- Could a robot assist with these tasks? | |
| 5) Discuss emotional intelligent features  
Probes  
- What is your understanding of emotional intelligent features?  
- Do you think this would be a useful feature to include on the robot? | |
| 6) Discuss a sales assistant robot value in the workplace  
Probes  
- Do you think a sales assistant robot could add value to your profession?  
- What are your views towards having an assistant robot in the workplace? | |
When undertaking a research or enterprise project, Cardiff Met staff and students are obliged to complete this form in order that the ethics implications of that project may be considered.

**If the project requires ethics approval from an external agency such as the NHS or MoD**, you will not need to seek additional ethics approval from Cardiff Met. You should however complete Part One of this form and attach a copy of your NHS application in order that your School is aware of the project.

The document *Guidelines for obtaining ethics approval* will help you complete this form. It is available from the [Cardiff Met website](#).

Once you have completed the form, sign the declaration and forward to your School Research Ethics Committee.

**PLEASE NOTE:** Participant recruitment or data collection must not commence until ethics approval has been obtained.

### PART ONE

<table>
<thead>
<tr>
<th>Name of applicant:</th>
<th>George Burns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisor (if student project):</td>
<td>Esyin Chew</td>
</tr>
<tr>
<td>School / Unit:</td>
<td>Cardiff School of Management</td>
</tr>
<tr>
<td>Student number (if applicable):</td>
<td>ST20093146</td>
</tr>
<tr>
<td>Programme enrolled on (if applicable):</td>
<td>BSc (Hons) Computing</td>
</tr>
<tr>
<td>Project Title:</td>
<td>Service Robots in the Automobile Salesperson Profession</td>
</tr>
<tr>
<td>Expected start date of data collection:</td>
<td>15/12/2017</td>
</tr>
<tr>
<td>Approximate duration of data collection:</td>
<td>1 month</td>
</tr>
<tr>
<td>Funding Body (if applicable):</td>
<td>n/a</td>
</tr>
<tr>
<td>Other researcher(s) working on the project:</td>
<td>None</td>
</tr>
<tr>
<td>Will the study involve NHS patients or staff?</td>
<td>No</td>
</tr>
<tr>
<td>Will the study involve taking samples of human origin from participants?</td>
<td>No</td>
</tr>
</tbody>
</table>

**Does your project fall entirely within one of the following categories:**

| Paper based, involving only documents in the public domain | No |

*Application for ethics approval v6 October 2016*
Laboratory based, not involving human participants or human tissue samples | No
Practice based not involving human participants (eg curatorial, practice audit) | No
Compulsory projects in professional practice (eg Initial Teacher Education) | No
A project for which external approval has been obtained (e.g., NHS) | No

If you have answered YES to any of these questions, expand on your answer in the non-technical summary. No further information regarding your project is required.
If you have answered NO to all of these questions, you must complete Part 2 of this form.

In no more than 150 words, give a non-technical summary of the project

Being an automobile salesperson is an incredibly busy job. A lot of time is wasted answering basic questions from customers, showing individuals around vehicles, giving technical specifications etc. This is time which could be used better elsewhere on the more important tasks such as finalising deals with serious customers where the salesperson can gain their commission.
The purpose of the project will be to build a prototype robot capable of communicating with customers to assist staff in day to day running of a car dealership. Taking care of the repetitive tasks and answering basic questions from customers walking around the show room. Customers can also ask the robot for information about a specified vehicle and be given a run down on its specifications etc. The project will attempt to explore how Artificial Intelligence features, e.g. emotion intelligence, can be included in the robot’s design.

DECLARATION:
I confirm that this project conforms with the Cardiff Met Research Governance Framework
I confirm that I will abide by the Cardiff Met requirements regarding confidentiality and anonymity when conducting this project.
STUDENTS: I confirm that I will not disclose any information about this project without the prior approval of my supervisor.

Signature of the applicant: George Burns  Date: 13/11/2017

FOR STUDENT PROJECTS ONLY
Name of supervisor: Esyin Chew  Date: 12/12/2017
Signature of supervisor:
Research Ethics Committee use only

<table>
<thead>
<tr>
<th>Decision reached:</th>
<th>Project approved</th>
<th>Project approved in principle</th>
<th>Decision deferred</th>
<th>Project not approved</th>
<th>Project rejected</th>
</tr>
</thead>
</table>

**Project reference number:** Click here to enter text.

**Name:** Click here to enter text.  
**Date:** Click here to enter a date.

**Signature:**

**Details of any conditions upon which approval is dependant:**  
Click here to enter text.

---

### PART TWO  only to be completed if primary research is to be undertaken

#### A RESEARCH DESIGN

**A1 Will you be using an approved protocol in your project?** No

**A2 If yes, please state the name and code of the approved protocol to be used**

N/A

**A3 Describe the research design to be used in your project**

Interpretivist approach to research which enables you to understand the world from the point of view of the people within it not rather than just through data and statistics. Primary data collected will be mostly qualitative data. This is to enable it to gain reasons, opinions and motivations from the research subjects which will also give insight into the reasoning behind the answers.

Interviews will be held with sales people – Specifically semi-structured interviews. The objective of this interview is to ask for advice and learn more about a career field, employer or job. Interviewing experts in their field is one more way to become more occupationally literate allowing sharper and more informed knowledge. It is important for the interviews to be conducted with individuals rather than groups to allow everyone to have an even say.

**Informational interviews:**

- Open ended questions to collect qualitative information.
- Freedom of response will allow the researcher to gain opinions and thoughts of the participant.
- Contact with the participants will begin in November/December and the interviews are forecasted to take place in January.
- Each interview will be recorded and will be 10 minutes in length.

---

3An Approved Protocol is one which has been approved by Cardiff Met to be used under supervision of designated members of staff; a list of approved protocols can be found on the Cardiff Met website here
Research Participants:
- The use of human participants should be chosen at random so as not to impact on the validity of the data collected. No extra considerations will be made for race, religion or gender.
- The targeted samples must work or have worked in a car sales environment.
- All participants will be over the age 18.
- Participant’s right to anonymity will be reiteration throughout the research process and they may withdraw their data at any point.
- All collected data will be stored on password protected computers, anonymised after my completion of the survey and no one will be able to trace this information back to me, the raw data will be held for 5 years when it will be destroyed/deleted.

Due to previous experience working in a similar environment, I know various individuals who work as salespeople or with salespeople who would be prepared to take part in this data collection. All results from the data collection will be collected anonymously in order to preserve the confidentiality of the participants.

A narrative analysis technique. It is a form of qualitative research. Narrative analysis uses, but is not limited to, interviews as the units of analysis to research and understand the way people create meaning in their lives as narratives. Narrative analysis allows the research participants to put the data into their own words and reveal the “why” behind their assertions. It works well with interpretive research as they both seek to better understand the “why” behind human action.

Consent
- Consent from participants is required from the interviewees by the completion of the consent form before they can take part in the study.

A4 Will the project involve deceptive or covert research? No
A5 If yes, give a rationale for the use of deceptive or covert research
N/A

A6 Will the project have security sensitive implications? No
A7 If yes, please explain what they are and the measures that are proposed to address them
N/A

B PREVIOUS EXPERIENCE
B1 What previous experience of research involving human participants relevant to this project do you have?
None

B2 Student project only
- What previous experience of research involving human participants relevant to this project does your supervisor have?
  Over 10 of student dissertation and research at both undergraduate and postgraduate level.
  Learning and Assessment Innovation In Healthcare with Wearable Technology
  2. Suhakam Goes Digital with Monash
  3. The Next Wave of Learning with Humanoid Robot
Learning and Assessment Innovation In Higher education with Wearable Technology

Investigating and developing mobile personal response system

C POTENTIAL RISKS

C1 What potential risks do you foresee?

Informational Interviews

Face-to-face interviews may present risk to the researcher:

- The interviewee may not want to answer questions if the information is confidential or personal.
- The interviewee may be offended by the questions.
- Participants may say something by mistake which may unnerve or make the interviewee panic. This may progress into anger towards the researcher.

C2 How will you deal with the potential risks?

Informational Interviews

- These will be arranged in advance at a location confirmed by the researcher and participant. The researcher will take their mobile phone with them to the interview.
- Participation Information sheet and Consent form will be sent to the interviewee to ensure they are aware of the topics up for discussion.
- The participant will have the right to withdraw their data at any point without penalty.

All participants will be notified that the researcher will have sole access to the data collected. Data used in the written report will be anonymised and the participants will be coded to safeguard from identification.

When submitting your application you MUST attach a copy of the following:

- All information sheets
- Consent/assent form(s)

An exemplar information sheet and participant consent form are available from the Research section of the Cardiff Met website and in this exemplar pack.