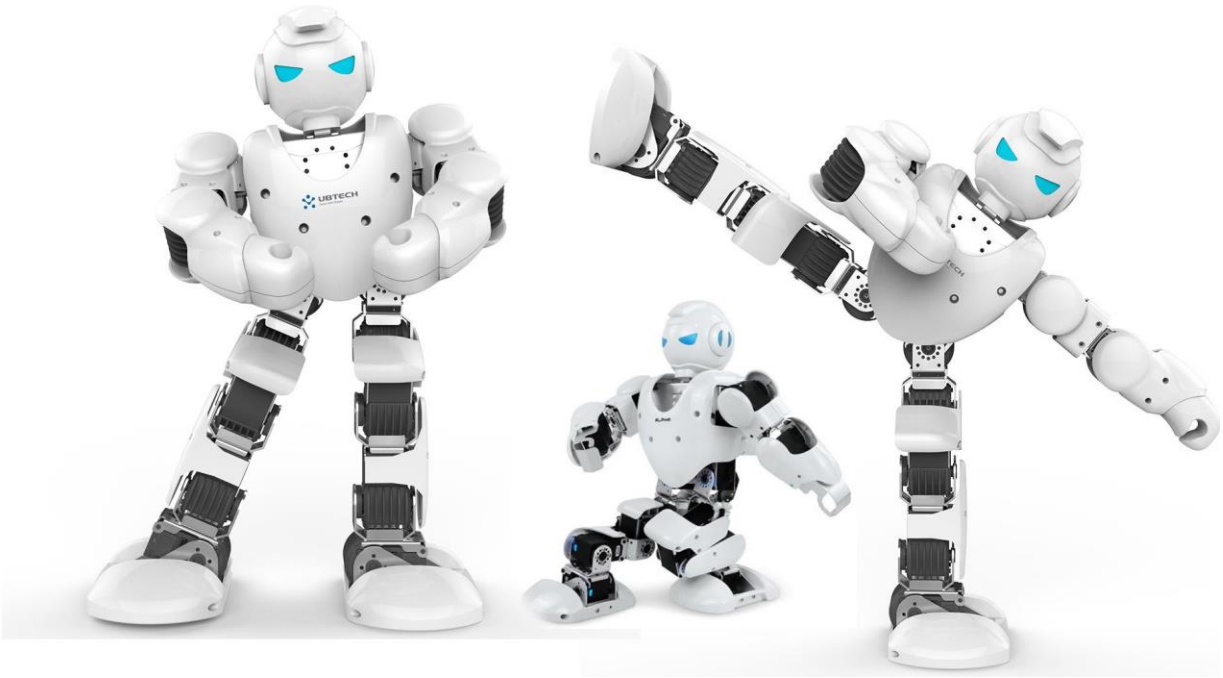


Effect of Personality on Robot Acceptance

Master Thesis

Authors: Borimir Vuchkov (124204) and Valentin Nikov (125379)

Programme: MSocSc in Service Management

Date: 15.05.2020

Supervisor: Kim Andersen

Characters: 215 569

Pages: 95

Abstract

The goal of this master thesis is to examine how different personality traits impact the acceptance of edutainment robots. This research has been done by implementing two of the most prominent theoretical models across the information system and psychology literature namely the Technology Acceptance Model (TAM) and the Big Five Personality traits theory.

We suggest a theoretical model which aim is to identify whether the five dimensions of personality, including *agreeableness, openness to experiences, neuroticism, conscientiousness, and extraversion* have an effect on two of the key factors included in TAM – *perceived usefulness* and *ease of use* that are hypothesized to be strong predeterminers of an individual's intention to use a certain technology. This study is conducted in the context of Yoga practice utilizing the robot Alpha 1 Pro.

In order to carry out the experiment, a 5-minute Yoga class in the form of a video was created during which the robot played the role of a yoga teacher who showcased a few Yoga poses and provided instructions accordingly. The video was later distributed to yoga practitioners across Denmark. Furthermore, self-completion questionnaires were administered to measure the personality of each respondent as well as their opinion on matters related to the acceptance of the robot.

Moreover, the analysis of our data revealed that certain personality traits have a significant impact on perceived usefulness and perceived ease of use which were also positively associated with behavioural intention to use. The dimensions of Openness to experience and agreeableness were found to have a positive relationship with the robot acceptance whereas Extraversion and Conscientiousness yielded no significance. Moreover, Neuroticism was proven to have a significantly negative effect on both perceived usefulness and ease of use.

Furthermore, results are discussed with suggestions about managerial implications and further research followed by a conclusion.

Contents

1. Introduction

As technology continues to exponentially improve and develop, virtually all aspects of human life are being influenced and reshaped in a significant manner. Due to this constant development of newer and improved technologies, our dependency on them appears to be on a path of an endless increase. Within the span of several years, the world has observed significant technological advances in robotics and artificial intelligence (AI) that have enabled their use in various contexts, processes and industries such as transportation, hospitality, manufacturing, communication, agriculture, medicine, logistics, finances, etc. (Andelfinger and Hänisch, 2017; Ivanov, Webster and Garenko, 2018; Lui and Lamb, 2018; Schommer, Patel, Mouraviev and Thomas, 2017).

Moreover, the progressive development of robotics and AI have created many opportunities for the vast majority of the contemporary industries to incorporate different interactive technologies that thoroughly replace or augment the nature of human labour (Ivanov et.al, 2018). This tendency increases the potential for disruptions and innovations within various types of business processes (Brynjolfsson, McAfee and Cummings, 2014).

For example, a current real-world application of robotics in the hospitality business could be observed in Starwood's Aloft Hotel where the robotic butler named "*Boltr*" is deployed to provide service to the hotel's guests by delivering the requested amenities to their rooms (Crook, 2014). On the other hand, Royal Caribbean Cruises managed to stand out from its competition and continues to hold the position of a pioneer and leading innovator within the travel industry by employing the first-ever robotic bartender (Tussyadiah, Zach and Wang, 2018)

This exponential growth and technological advances have been enabled to a large extent by the principle that came to be known as Moore's Law. The law reasons that the number of transistors on a microprocessor chip will be doubled approximately in an interval of every two years, increasing the chip performance along the way (Moore, 1965). Based on this exponential improvement described by Moore's law, the first rudimentary version of the home computer introduced in the '70s to the general market turned into the more sophisticated computer machines that operated through the '80s and '90s. Respectively, this led to the development of smartphones, high-speed internet, smart cars, home appliances, and technology connected through the Internet of Things which prevails in the modern world.

The growing use of AI and robotics gives solid indications that the world is taking another important evolutionary step towards new means of value production and service delivery which organizations are currently beginning to adjust and transition towards.

Historically, the world has experienced several major industrial revolutions that defined the process of manufacturing goods and the production of value. In the latter half of the 18th century the First Industrial Revolution marked a period of prolific development occurring "..on local, regional, national, continental and global context" (O'Brien and Patrick, 2006, p.2) While the process was shaped by major political, social, cultural and geopolitical forces, its final conclusion was the transition from agrarian and rural societies towards urbanization and industrialization (O'Brien and Patrick, 2006*)*. In this new industrial economy, the introduction of machines and inventions such as the steam engine made mass production possible as goods were no longer painstakingly produced by hand. Instead, production was placed into factories which made the process cheaper and more standardized (O'Brien and Patrick, 2006).

Subsequently, the Second Industrial Revolution which usually dates from 1850-1914 began. This was a period of major macro and micro inventions that had a huge impact both on production and quality (Mokyr, 1998). Based on the increased effectiveness in research and micro inventive activities, plenty of macro inventions was achieved including the telegraph and railroads networks, sewage systems, water, and gas supply. The advancement in manufacturing and production technology enabled the widespread deployment of such systems which had been previously constrained to only a limited number of selected cities (Mokyr, 1998). In particular, the expansion of railroad and telegraph networks established the possibility for movement of people and ideas in an unprecedented manner, the result of which was a significant level of globalization (Baldwin and Martin, 1999). Other central achievements of the Second Industrial Revolution are the emergence of new industries and sources of energy such as gas, electricity, and oil (Baldwin and Martin, 1999).

In a similar fashion to the preceding Industrial revolutions, the Internet Revolution, also recognized as the Third Industrial Revolution, has stemmed from the development of major technological innovations. Even though there are numerous important innovative steps that substantially contributed for the emergence and consequent growth of the Internet, there are four advances in technology that must be emphasized: low-cost computing power enabled by the integrated circuit; a high bandwidth telecommunication network; advancement in software development that made computers easier to use and highly versatile; and the creation of the World Wide Web (Baldwin and Martin, 1999).

Nowadays, despite its recent emergence and relative lack of conceptualization, there is substantial support that we are entering a new era of industrial revolution named Industry 4.0. The concept was first proposed back in 2011 for the development of the German economy (Roblek, Meško and Krapež, 2016). The concept establishes the idea that the fourth technological revolution has been already launched with the development of technologies such as The Internet of things (IoT), cyber-physical systems production and the Internet of Services (IoS), cloud-based manufacturing, Radio Frequency Identification (RFID), Enterprise Resource Planning (ERP), etc. (Lu, 2017). These technologies are based on continuous communication through the Internet that respectively allows for an uninterrupted exchange of information and interactions not only between humans (C2C), humans and machines (C2M) but also between the machines themselves (Cooper and James, 2009). The prime goal of Industry 4.0 is to increase productivity, to raise operational efficiency, and to achieve higher levels of automatization (Thames and Schaefer, 2016). Furthermore, Posada et al. (2015) recognize digitalization, optimization, and customization of production; adaptation and automation; value-added services and businesses; automatic data exchange and communication; and human-machine interaction (HMI) as the five main pillars on which Industry 4.0 stands.

The development of various machines and robots have been the common factor that enabled the Industrial revolutions of the past and present. In the past robots were used exclusively in industrial workplaces such as factories, thus being named industrial robots. Industrial robots are defined as "automatically controlled, reprogrammable multipurpose manipulator programmable in three or more axes" (International Federation of Robotics, 2020). The use of those types of robots is keeping its steady growth – from 300 000 per year in 2016 to almost 400 000 installations in 2017 and a slight increase in 2018 leading to 422,271 units installed in that same year. Moreover, it is expected that in 2022 the number of annually produced robots will reach approx. 580 000 units (International Federation of Robotics, 2019).

On the other hand, with the emergence of Industry 4.0, robots are stepping outside of the factory boundaries by finding more widespread and versatile use. Thus, the term of service robots has emerged. According to the International Federation of Robotics, service robots are categorized with "a degree of autonomy, which is the ability to perform intended tasks based on current state and sensing, without human intervention." Moreover, service robots are further subcategorized into robots for professional use and robots for personal (domestic) use (International Federation of Robotics, 2019). Both of these markets are experiencing rapid growth, for example, service robots for domestic use are expected to reach 61.1 million units in 2022 (International Federation of Robotics, 2019). The more well-known examples of personal and domestic robots produced for the mass market are robot-mowers, floor-cleaning robots, and robots for *edutainment* (a term that emerged from the words entertainment and education). Robots for entertainment and education

represent nearly one-fifth of the total market for domestic robots with 4,5 million units sold in 2019 (International Federation of Robotics, 2019). The more prominent examples of such products are LEGO MINDSTORMS robots, SONY AIBO, I-Cybie, Alpha 1 pro, Walker, etc.

Hence, as service robots are becoming more and more prevalent in contemporary society, it is important to understand what are the enablers or inhibitors that characterize the success of such HRI interaction. As robots become further and further integrated into our professional and day-to-day lives, organizations will need to advance and complete their understanding of the way their customers react and perceive such technologies.

The paper makes an effort to provide empirical evidence of the relationship between human personality and the acceptance of robotic technology. Specifically, our research will focus on "edutainment" robots for personal (domestic) use in relation to which the robot Alpha 1 pro will be utilized.

Edutainment robots facilitate interactions between intelligent agents (the robot and the users) (Lund and Pagliarini, 2001), on account of which we suspect that the user's personality should play a more notable role for the success or failure of the interaction. The main goal of Edutainment robots is to take part in people's entertainment and education by playing together with their human partner (Gonzalez-Pacheco, Ramey, Alonso-Martin, Castro-Gonzalez and Salichs, 2011) which means that the social aspect in such interaction is of the utmost importance as opposed to what we observe when dealing with the interaction between humans and professional or industrial robots.

In fact, human-robot social interaction is vital for the spread of robots in human's daily life, because effective social interaction will enable robots to perform all kinds of tasks within the human society including house duties, care for the elderly, education and entertainment, personal assistance, providing information and direction at public locations, assisting people with motor or cognitive disabilities, etc. (Salichs, et.al, 2006)

There is a bulk of empirical evidence suggesting that people's behaviour and perception are strongly mediated by their personality in the context of every-day-life. (von der Pütten, Kramer and Gratch, 2010; George, 2002; Higgins, 2000). However, the research on human-robot interactions and its relation to personality has been rather constrained. Even though researchers take into consideration personality in human-computer interactions, they are primarily concentrated on the incorporation of personality traits in robotic devices and artificial entities. (Gonzalez-Pacheco et al., 2011; André and Rist, 2001; Moon and Nass, 1996; Isbister and Nass, 2000). Those types of studies are interested in for example the ability of

the user to recognize observed emotional and personality state in robots or whether those users will react in a similar way to the technology's artificial personality as they would towards a human counterpart. (von der Pütten, et al., 2010). In fact, it has been demonstrated that generally, people react towards media and robots exhibiting social intelligence in the same manner they would react towards a real person (Moon and Nass, 1996).

Nevertheless, to our knowledge, there have not been any studies regarding human personality as an enabler of human-robot interaction. Therefore, we are going to investigate whether or not people with certain personality traits are more prompt to interact with robots and which traits prevent them from even considering collaborating with edutainment robots.

Furthermore, our research will be conducted in the context of yoga teachings. For the last two decades, the Pilates and Yoga studios industry has been constantly growing as people are looking for alternative ways to keep their minds and body healthy. In fact, yoga has been one of the fastest-growing industries worldwide (Lehto, Brown, Chen and Morrison, 2006). In the USA alone the industry reached an average annual growth of 12,1% within the period of 2002 to 2012 in spite of the 2008 recession which merely slowed down revenues but did not affect the growth of this increasingly popular practice (Setar and MacFarland, 2012). Similarly, high levels of expansion and revenue growth are projected for the near future as well (Setar and MacFarland, 2012).

With the increasing popularity of yoga worldwide, many different trends emerge within its teachings. For instance, at present many experimental forms of yoga are provided as an alternative to practitioners including aerial yoga, disco yoga, naked yoga, beer yoga, and many more. (Yoga Statistics 2020, February 11). Moreover, many attempts to integrate yoga and technology have been previously made bringing the ancient discipline into the 21st century. In 2015 the first "intelligent" yoga mat, named SmartMat, has been introduced to the market. This device is able to register weight distribution in the feet and hands which allows it to guide its users to the right yoga pose for the specific body (Sundholm, Cheng, Zhou, Sethi and Lukowicz, 2014). Moreover, a variety of apps, games, and online yoga classes incorporate technology to change the traditional perception of how yoga is meant to be practiced.

However, it is rather unclear how deep the penetration of technologies into the yoga industry can turn out to be and if it is possible to replace yoga teachers with robots in the foreseeable future. As robots are continuing to upgrade their capabilities and performance a lot of the dangerous, repetitive, and monotonous jobs are endangered of being fully replaced by robots. Nevertheless, it is argued that jobs and services that

require “creativity, empathy, judgement and critical thinking” will never surrender to the developing automatization which we observe today (Smith and Anderson, 2014, p.6).

The philosophy of yoga itself is related to the realization of one’s true nature and inner potential. The practice of yoga goes deeper than simply keeping your body fit by doing various exercises. It is truly about reading your inner states and gaining complete control over yourself (Taimini, 1989). Because yoga teachers help you reach that inner state through mentoring and guidance, it is therefore uncertain if robots could replace them and if such technology will be accepted as viable yoga partners by practitioners. Nevertheless, it should be acknowledged that yoga does not have such a spiritual and emotional value for everybody as there are people that practice it to simply keep their physical health in check (Lehto, Brown, Chen and Morrison, 2006). As people have different reasons and understanding of yoga, we therefore, wonder if different personality traits will affect the acceptance of robot agents in that industry.

Additionally, for that purpose of our research, the robot Alpha 1 Pro will be appointed as a yoga teacher which will invite yoga practitioners to participate in a class led by itself. Moreover, this approach has been selected on the foundations of strong empirical data concluding that particular types of personality traits, such as neuroticism and anger/hostility, etc., are significant risk factors leading to poor health as a consequence of insufficient physical activity (Smith, 2006). However, the practice of yoga is *“*an ancient activity designated to both healthy and unhealthy individuals. It integrates physical, mental, and spiritual components and may improve aspects of health” (Shiraishi, Gadelha, Bezerra and Porto, 2017, p.27). As an activity designed to improve both mental and physical health, we, therefore, expect that yoga practitioners will exhibit distinct personality traits that should affect positively or negatively the attitudes towards such technology.

Essentially, Yoga is the understanding of the transcendental reality that is around us, hence achieving Self-realization. It could also be defined simply as a *spiritual discipline* in Hinduism, Jainism, and other schools of Buddhism (Feuerstein, 2003). As mentioned above this is achieved through including physical, mental, and spiritual elements in the Yoga practice. Such elements include practices like breath control, mental techniques, concentration, meditation as well as postures (poses) (Feuerstein, 2003). In our experiment, we were focused just on the physical element of Yoga and more specifically the postures that are executed during the training. In relation to that, our approach to yoga could be best related to the style of Hatha-Yoga which nowadays is the most practiced style in the Western world due to its health and fitness benefits. Hatha-Yoga is best described as *forceful Yoga* or *Yoga of Force* which signifies the inner power of an individual in Yoga (Feuerstein, 2003, p.41). Whenever performing Hatha-Yoga, practitioners achieve Self-

realization through the energy of their body by firstly strengthening it in order to improve their ability to achieve higher realizations. Additionally, they transform their body into a *divine body* which further allows them to accomplish self-realization (Feuerstein, 2003). This is achieved mainly through different asanas which are referred to as the physical postures that are executed during a Yoga class.

Moreover, the literature suggests that personality characteristics have an impact on cognition and behaviour, including the efficacy of practices like physical activity and meditation. In relation, Rhodes and Smith (2006) examine how personality correlates to physical activity. Their findings suggest that the trait of neuroticism has a slightly negative effect on physical activity. On the other hand, extraversion and conscientiousness were found to positively associate with physical activity. Furthermore, in a separate study Smith (2006) conscientiousness has been positively associated with the strive for healthy behaviours. Thus, we also hypothesize that personality will have an effect in regards to the physical component in the Yoga service. Additionally, the Openness to experience dimension is found to have a positive impact on job performance amongst employees from different industries including IT, finance, and others (Chokkalingam, Kumari, Akhilesh and Nagendra, 2015). The aim of this study was to examine the impact of Integrated Yoga practice on the above-mentioned personality trait and results indicated a positive relationship between the two notions. Consequently, the authors also propose that the practice of Integrated Yoga could have a positive impact on employee performance (Chokkalingam et al., 2015).

1.2 Problem Formulation

As it was discussed above service robots are being progressively integrated into both our professional and personal lives. Robots with different functionalities and purposes are performing various tasks (check-in in hotels, entertainment, mental-health, and companionship, etc.). Therefore, it is of the utmost importance for practitioners and academia to increase their knowledge of the factors that can hinder or enable successful human-robot interactions. Nevertheless, such interaction could be contingent on the context in which a given robot technology is implemented.

Hence, in order to prove empirically whether or not the external factor of personality which we incorporate into Technology Acceptance Model (TAM) has an effect on the acceptance of edutainment service robots we are going to answer the following question:

How does a user's personality traits affect the acceptance of robot technology?

1.3 Thesis structure

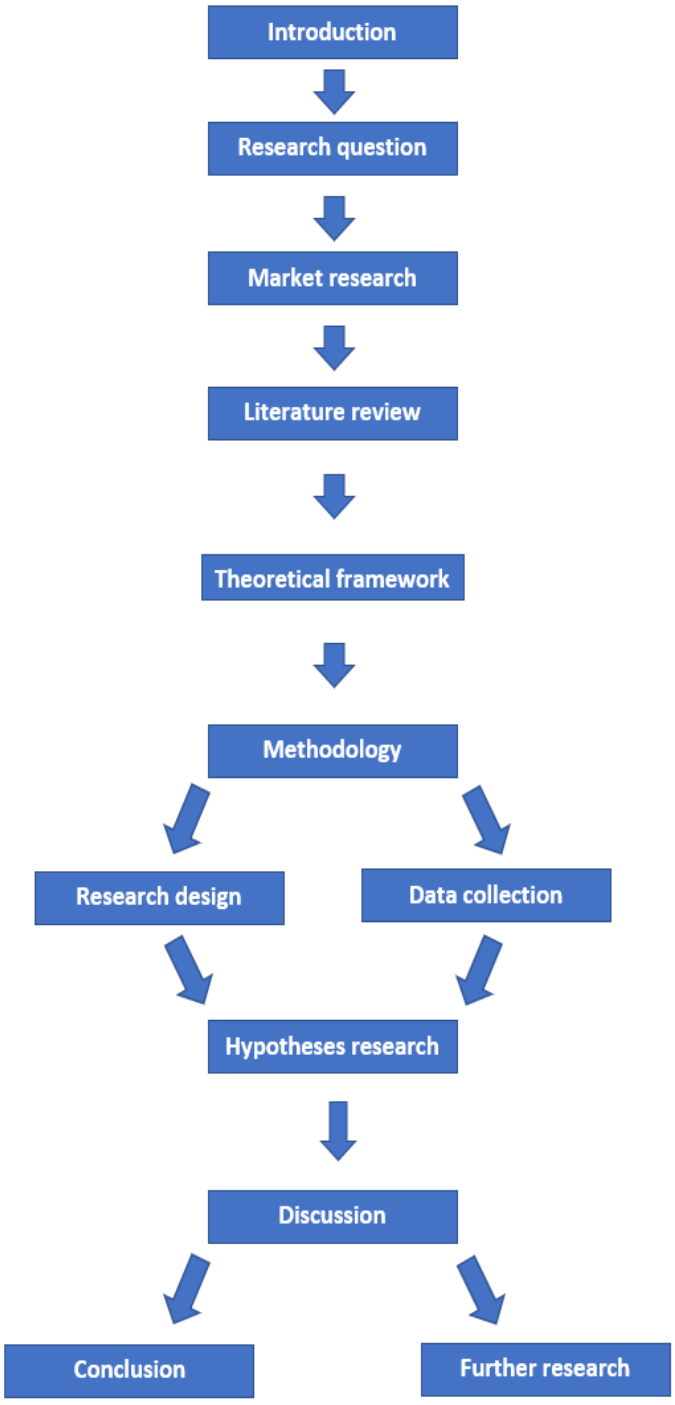


Figure 1 Theoretical framework source: own

Here, a simple overview of the paper structure will be provided. This thesis proceeds with a description of different relevant robot examples on the current market as well as the Alpha 1 Pro robot which was used in this experiment. Furthermore, a literature review will be carried out in order to showcase the different literature advancements and researches that have been carried out on topics in relation to technology acceptance, personality, and robots. Following will be the theoretical framework of the paper where we will identify the different theories and models that are implemented in this research.

Moreover, the methodological part will give better clarification on the research design and data collection methods that were utilized in order to carry out the experiment. In the following chapter, the results of our questionnaires will be analyzed and we will examine the different hypotheses and test whether there are significant relationships between the five personality traits and the acceptance of robots within the practices of yoga. Subsequently, a discussion will be provided with regards to the findings of our hypotheses' analysis. The final

part of the paper will consist of a conclusion as well as consideration of further research that will be recommended. This is better illustrated in Figure 1.

1.4 Market research

The following section will discuss briefly other prominent examples of service robots in order to elaborate on the level of development within the field. We are going to discuss other possible opportunities and contexts in which similar research to the one we conduct here could have been made. Additionally, as it was established earlier the scope of this paper will not take into consideration robots for industrial use or robots that do not rely on human-robot interaction to complete their goals. Therefore, this section will also be limited to service robots that interact with the user in one way or another.

One of the pioneers in the development of humanoid robots is the multinational conglomerate Honda as its endeavours in the field began back in 1896 (Akhtaruzzaman and Shafie, 2010). Over the years Honda has built many different prototypes with some of its earlier models known as E1 to E6, which focused on leg locomotion. Subsequent improvements followed as the torso, head, and arms were added improving the humanoids functionality and balance (Akhtaruzzaman and Shafie, 2010). The development of those early prototypes led to the unveiling of the first humanoid robot P1 in 1993 which was a rather large machine reaching the height of 1,9 m and weight of 175 kilos. By the end of 2000, the company introduced to the world its now-legendary humanoid robot named ASIMO (Domaine, 2008). Subsequently, the robot received several upgrades as new models were introduced in 2004, 2005, and 2011. This was not only the first robot to walk on two legs, but it's later versions were also able to estimate the distance and direction of objects, recognize moving objects, navigate autonomously due to advanced sensors in its body and most importantly interpret voice commands and human gestures (for example head nods, hand wave, handshakes). These functionalities enable the robot to dance, hop, run, and kick. Moreover, the robot can also engage in conversations by answering questions. It is furthermore able to recognize the faces of up to 10 people and address them by name. The 2011 release stands at 130 cm tall and weighs approx. 48 kg. Some of the more prominent accomplishments of ASIMO over the years were teaching its own dance group and playing football with Barack Obama. Unfortunately, the company ceased production of ASIMO in 2018 as it made a decision to apply the robot’s technology into more practical areas such as transportation, nursing, etc. (Deahl, 2018).

As it was mentioned previously, the hospitality business is one example within the service industry for a slow but steady robotization as robots are increasingly being incorporated in the service delivery process. The robotic butler built by Savioke has already become part of the Starwood workforce which is one of the largest hotel chains in the world. Those types of robots, also known as Botlr, are able to perform a variety of tasks in the front and backstage of the service delivery process by delivering amenities and navigating guests around the hotel facilities (Crook, 2014). For example, if the hotel guest calls down to the reception to order a toothbrush the hotel employees need to only load up the robot, dial the room number and then Botlr will handle the rest of the job. Ultimately, this gives more time for the employees to provide and create a more personalized experience. Those types of robots are built to perform specific functional tasks and therefore the interaction with the user is minimal. Because of this, their design does not bother to imitate human-like features.

On the other hand, the world-famous humanoid robot Pepper was built by SoftBank Robotics with the purpose of interacting and socializing with people. The robot has a height of 120 m and a weight of 28 kilos. It also has an integrated touchpad on its chest that can be used for the completion of various tasks (Robotics SoftBank. n.d.). Pepper has found success by being effectively employed in several offices in the UK as a receptionist. The robot is able to identify clients through facial recognition technology, greet visitors, send alerts, and arrange for beverages to be prepared. In addition, Pepper has been used in medical facilities, bank branches, and restaurants in Japan, and across multiple airports located in North America (Pawson, 2018). Furthermore, Pepper features can be customized for each location and business taking into consideration that the interaction with the guests depends on the specific context. For example, at each airport, the robot will provide specific directions to the gate, nearest restrooms, restaurant recommendations, menu information, etc. This elevates the customer experience by creating unique and individualized types of interactions. All of this puts Pepper in the position of one of the best social service robots in existence because it simulates to a relatively high degree a real human to human interaction as it is able to change its facial expression, tell jokes, speak in many languages and adapt to people's emotions. This creates the perception within people that the robot has its own genuine personality (Rossi, et al., 2018). However, such a level of advancement comes with a price. Each individual robot is sold at approximately 1.500 USD with payment agreements that include equipment insurance and a network data plan. Therefore, the total costs over 36 months can reach up to 30, 000 USD (RobotLab, 2020).

Another robot with similar capabilities but without such defined humanoid features as Pepper is the robot CRUZR developed by Ubtech which is a customizable, could-based, service robot that is designed with arms and torso but does not have a face, eyes, nose, etc. An argument could be made that this could have

been a conscious decision by the designers as humanoid robots with strong human features can create false expectations in people as to what should the nature of the interaction be and also regarding the robot capabilities (Goetz, Kiesler and Powers, 2003). The robot is becoming relatively popular in the US as a restaurant assistant. CRUZR has many capabilities among which is to remember the specific layout and arrangement of the table in the restaurant. This allows it to navigate around and freely reach the customers who are then able to make their orders by tapping on the robot's face. The robot is then intelligent enough to deliver the order to the right person in the restaurant (Gebhart, 2019).

In 2019 Ubtech released a next-generation robot that was named Walker. The robot is 1.45 cm tall and weighs 77 kg as its design includes a torso with improved balancing, arms, and hands that can grab and manipulate a variety of objects. Also, it includes a full range sensing system, voice, vision, and touch. This robot can be used both in domestic and business environments performing a variety of activities. For instance, the robot can perform artistic activities such as drawing and playing the piano. (Gebhart, 2019).

There are other entertainment and educational robots that are built for human-robot interaction purposefully but are not designed to resemble human appearance. For example, the robot Vector by Anki is a small car-like robot that can provide companionship and help at home. The robot is alive with personality as it can engage by sound, sight, and touch. Vectors can take pictures, time the dinner, show the weather, control the smart devices at your home like lights and speakers, etc. More importantly, it answers questions as it is connected to the internet and compatible with Alexa. Furthermore, it expresses emotions when it's being petted and it's also able to recognize emotional states in people (Simon, 2018).

Aibo Sony ERS-1000 is another domestic robot companion that relies on interaction with people in order to entertain its users. Aibo has been introduced in 2018 and is one of the most life-like and responsive robot companions that could be found on the market. It is a small robot that looks and acts as a real-living dog. The robot AI has the capability of self-teaching and learning from its owner and surrounding environment based on which a distinct personality is developed over a certain period of time. Just as a real dog it can learn tricks and form its own habits. Additionally, it can recognize up to 100 different people and interpret facial expressions as well. Aibo can be purchased for approximately 2900 UDS (Tarantola, 2020).

1.4.1 Why did we choose Alpha 1 pro?

As the discussion above demonstrates we could have made our research by utilizing other kinds of robots that possess different functionalities and are able to perform different tasks in other service contexts. However, we have selected Alpha 1 pro as the facilitator of our research for several important reasons.

First, it was important for this project to employ a robot with human-like features in order to create the right expectations in the yoga practitioners about its abilities. Previous studies reveal that "robot's appearance provides cues about the robot's capabilities and propensities" (Goetz, 2003, p.1). Taking into consideration the nature of the yoga practice it was, therefore, a paramount objective for us to have a robot resembling as much as possible a real human in order to increase its chances of being accepted as a yoga partner and an equal by the study subjects.

Moreover, literature related to the topic of robot appearance argues that overall people tend to show higher preferences for robots that resemble human-like appearance (Walters, Syrdal, Dautenhahn, Boekhorst and Koay, 2007). Therefore, as it was already questionable whether or not yoga practitioners would be accepting of the concept, we wanted to avoid any other variables that could later be justifiable reasons for negative attitude towards the robot and dismissal of our results.

Finally, after extensive desk research in regard to other service robots, it has been decided that Alpha 1 pro is the most appropriate option for the project considering our financial constraints and price to quality ratio. Alpha 1 Pro is "sufficiently" advanced (in comparison to other similar robots) to establish human-robot interaction and in particular to perform a variety of yoga moves that other similar robots cannot. Other more advanced service roots that are used for example in LEGOLAND to greet and check-in customers (Jensen, 2020) are beyond our budget and most importantly would require a different type of experimental procedure and design to be realized.

1.4.2 Alpha 1 pro description

Design

The robot that we are going to use is called Alpha 1 Pro which is designed and produced by UBTECH Robotics, founded in 2012, and nowadays it is a global AI and humanoid robotics organization (UBTECH,

n.d.). The robot is a domestic humanoid robot that can be used for education and entertainment. Alpha 1 Pro has size with the following dimensions 401x198x124mm and weighs about 1.65kg. The robot comes in full while colour and its' body is mainly produced from aluminium alloy and ABS plastics, making it durable upon impacts. In terms of movement, the robot is designed with sixteen dynamic, high-torque servomotors, (six located on the upper part of the body and ten located in the leg area) mimicking the joints in the human body and allowing him to have sixteen degrees of motion freedom.

Relating to the interactivity of Alpha 1 Pro, it is equipped with embedded speakers located on the back of its head as well as in the ears of the robot, providing it with the ability to produce pre-recorded sounds. Moreover, Alpha 1 Pro has LEDs located around its body, mainly in the area of the eyes (aimed to make the robot "blink"), and ears. Additionally, the battery and battery slot are located on the back of the robot, forming its' "backpack". It is also where the power and emergency buttons are located for easy access.

Performance and functionality

In terms of capabilities, the robot can imitate quite a lot of human movements including but not limited to walking freely on a flat surface, dance, replicate Yoga moves, fight, replicate a variety of movements done in sports such as basketball, football, wrestling, diving, weightlifting, rowing as well as a few moves from martial arts like Taekwondo or Judo. The robot can also serve as a human companion as it is able to tell different stories in an interactive way utilizing all of its sound and visual capabilities. It has a battery life of about an hour per each charge (UBTECH, n.d.).

Alpha 1 Pro is easily connected to a mobile device through an application and is compatible with every smartphone supporting Android 4.0 and above or iOS 7.0 and above. The application is downloadable through the "Google Play" android app store and the "Apple" app store respectively. The robot could be easily controlled through the application by choosing from a variety of downloadable actions from the in-app action store. Users can also program their own moves through either logic programming or using the PRP (Pose, Record, and Playback) function which allows the user to adjust the joints of the robot in a desired way during which the PRR function will record the movements and play each pose autonomously afterwards. Moreover, additional moves could be programmed on PC or Mac by the use of 3D visual programming software provided by UBTECH which we also utilized in order to program or tailor some of the moves for our own experiment (UBTECH, n.d.).

Public appearances

Alpha 1 Pro has also made a few public appearances. It is the official robot sponsor of Manchester City Football Club and has been used for different purposes in the club. The robot has been used for meeting and greeting players and fans as well as for online competition during which the club's players and fans tried to imitate a celebration dance performed by the robot. Afterwards, the participants recorded and uploaded their own version of the dance online (UBTECH Robotics, 2017). Moreover, a football game has been simulated by a few of the Manchester City players using 5 Alpha 1 Pros on a mini-field and a dance-off between the robot and some of the players. (UBTECH Robotics, 2017)

Another appearance of Alpha 1 Pro was at the Spring Festival Gala in Shenzhen, China in 2016. At the event, UBTECH set a new world record for "most robots dancing simultaneously", as they were using 540 units of the robot as dancers during a live performance (Guinness World Records, 2016). Alpha 1 pro was also awarded as "Most Eye-catching Product" at the 2016 IFA show and has been involved in the Transformers 5 movie. (Daffodil Robotics Lab, 2017)

2. Literature review

2.1 Technology Acceptance

It is noteworthy to mention that acceptance among users is imperative for the development of any new-coming technology that people are exposed to. In relation to that, different theories and frameworks have been developed throughout the years in order to clarify the user's acceptance towards a particular technology. Some of these theories include the Theory of Reasoned Action (Ajzen, Albarracin and Hornik, 2007), Theory of Planned Behaviour (Ajzen, 1991) and Technology Acceptance Model (Davis, 1989).

The theory of Reasoned Action (TRA) was introduced by Ajzen and Fishbein and initially applied to psychological and sociological research (Ajzen, et al., 2007). Nevertheless, academics have adopted this concept as a theoretical background for other types of studies as well which investigate user's acceptance towards different technologies and IT systems such as acceptance on Internet banking, Green Information systems or even technologies applied in agriculture (Nor, Shanab and Pearson, 2008; Mishra, Akman and Mishra, 2014; Rehman et al., 2003). The goal behind the Theory of Reason Action (TRA) is to explain the human behaviour by showcasing the relationship between two cognitive elements - *attitudes* which are

based on person's beliefs about the consequences of a given action and can be either *favorable* or *unfavorable*; and *subjective norms* also are known as social norms defined as "perceived social pressure to perform or not perform the behavior" (Ajzen et al., 2007, p.5). These components form the intention to perform a certain behaviour, thus forming the behaviour itself.

Furthermore, the Theory of Planned Behaviour (TPB), builds upon the TRA by including an extra component named *perceived behavioural control* which could be explained as the perceived level of control and capability that an individual considers to have over their behavior (Ajzen et al., 2007). The behavioural control is defined by the resources that an individual has available to him/her, such as time, money, skills, etc. (Ajzen, 1991). The intention of adding this component is due to the fact that "the resources and opportunities available to a person must to some extent dictate the likelihood of behavioral achievement." (Ajzen, 1991, p.183). Thus, Ajzen (1991) also touches upon the idea of self-efficacy (referred to an individual's belief in his or her capacity to execute behaviours) which is in-line with the notion of behavioural control and has a direct effect over the behavioural intention.

Another model that is related to technology acceptance is the so-called Technology Acceptance Model (TAM) developed by Davis (1989). The model is adopting concepts from both of the above-mentioned theories and the initial version of the framework is composed of two elements that determine the *behavioural intent* (BI) – *perceived usefulness* (PU) and *perceived ease of use* (PEOU). Consequently, the behavioural intent leads to the actual use of a given technology. Furthermore, external variables are also included as they have effect on PU and PEOU. An additional element *attitude towards using* (A) is included as it further mediates the relationship between PU, PEOU, and BI.

The model has been widely used in the academic field by a number of researchers. The measurements of PU and PEOU have been studied in a variety of contexts and information systems by Adams et al. (1992) and the replicated studies proved the validity and reliability of those measurements. Moreover, the test-retest reliability of the PU and PEOU dimensions has been confirmed by Hendrickson et al. (1993,1996) who also suggests that the TAM is a reliable tool in terms of test-retest analysis.

Other researchers suggested that the model should be altered by including an additional measure. Based on findings of their confirmatory factor analysis, Segars and Grover (1993) proposed the measure of effectiveness to be added to TAM as an additional sub-scale to PU. Nevertheless, after performing structural equation modeling analysis, Chin and Todd (1995) argued against including "effectiveness" as a separate measure due to their findings that PU has reasonable psychometric properties, therefore no substantial justification for separating PU into two scales was present.

In addition, a variety of studies have utilized the TAM in different settings researching the acceptance of technologies. Such technologies included ERP systems studied amongst 409 end-users, telemedicine and its effect researched amongst 408 physicians, a bulletin board systems examined including 401 accountants in an organizational setting, and COPLINK which is a data sharing and crime analytics platform that is designed to help law enforcement, was also studied among 283 law enforcement officers (Amoako-Gyampah and Salam, 2004; Chau and Hu, 2002; Jen-Hwa Hu, Lin and Chen, 2005; Mathieson, Peacock and Chin, 2004). The results of these studies indicated that PU had a stronger effect on the intention to use than PEOU.

On the other hand, there are also contradictory studies indicating the opposite effect between PE and PEOU. Brown, Massey, Montoya-Weis, and Burkman (2002) conducted a study between 107 bank employees on a computer banking system, Gong. et al. (2004) researched web-based learning systems among 152 teachers, and Moon and Kim (2001) studied the acceptance of the World Wide Web by 152 graduate students.

However, the model has been extended by different scholars who explore different external variables that potentially could have an effect on PU and PEOU. In a study by Chen, Rong, Ma, Qu, Xiong (2017), which examined the technology acceptance towards mobile games integrated into the Chinese social website "WeChat", external variables including *perceived enjoyment*, *use context*, *flow* (which in their case is referred to "the situation that people stay curious about the system and try to accomplish technological competence while being engaged in an action" (Chen et al., p.5)), *altruism* and *social interaction* were set as influencers of PU, PEOU, and BI.

In another study, conducted by Hakkak, Vahdati, and Biranvand (2013) a number of other external variables were identified. The study was conducted in relation to the acceptance of online banking amongst bank 210 customers. External variables such as *social influence* and *awareness of services* were theorized to have influence on perceived usefulness whereas *self-efficacy* and *quality of internet connection* were identified as determinants of perceived ease of use. Moreover, factors as *gender, education, trust,* and *resistance to change* were suggested to have an effect on the attitude towards use (Hakkak et al., 2013).

In addition to that, a variety of variables are also identified in different research contexts – *perceived community size and structure* in the case of online vendor website (Koch, Toker and Brulez, 2011); *citizen satisfaction, trustworthiness*, and *service quality* in the context of measuring the behaviour towards adoption an e-government system (Hujran, Aloudat and Ikhlas, 2013); and Prieto, Miguelanez and Garcia-

Penalvo (2014) build upon the technology acceptance model by incorporating variables from other models that fit the goal of the study (some of them in-line with the above-mentioned studies) such as *previous experiences, perceived enjoyment, subjective norm, self-efficacy* and *facilitating conditions* in order to measure mobile acceptance amongst teachers.

Furthermore, Venkatesh and Davis (2000) developed a second version of the technology acceptance model (TAM2). The new model distinguished external variables which are significant to predict perceived usefulness. They included *subjective norm* (which is the perception of an individual that significant for him/her person or group will approve or disapprove a given behaviour) which is further moderated other factors namely *experience* and *voluntariness*; *image* (the wish to have a favourable status/reputation in a social group); *job relevance* ("an individual's perception regarding the degree to which the target system is applicable to his or her job" (Venkatesh and Davis, 2000, p.191)); *output quality* (the level of functionality of the technology towards the required tasks), and *result demonstrability* (the ability to produce tangible results by using the innovative technology) (Venkatesh and Davis, 2000). In their longitudinal studies, Venkatesh and Davis (2000) identified the newly added external variables to have a positive influence on perceived usefulness and behavioural intention.

2.2 Personality traits

Personality is widely studied by many researchers and academics throughout the years. There are many different definitions of personality and there is still a debate on how to define it. Taking the point of view of Allport (1961) we can define it as "the dynamic organization within the individual of those psychophysical systems that determine his characteristic behaviour and thought." (McLeod, 2017). Another definition is provided by Cattell (1950) who describes personality as "That which permits a prediction of what a person will do in a given situation" (Cherry, 2019). Furthermore, if we take into account a more recent approach to personality, we can refer to Funder (2001): "Personality refers to individuals' characteristic patterns of thought, emotion, and behaviour, together with the psychological mechanisms - hidden or not - behind those patterns." (Cherry, 2019). Thus, we adopt the belief that personality could be understood through personal characteristics or traits that determine the behaviour of an individual.

In psychology, trait theory is widely used to examine the personality of individuals. This theory postulates that personality could be measured by traits which are used to signify consistent intercorrelated patterns of

behaviour. Traits are also defined as: “generalized and personalized determining tendencies – consistent and stable modes of an individual’s adjustment to his environment” by Allport and Odbert (1936, p.26). A trait can be seen as a consistent characteristic of an individual that instigates a particular behaviour. Consequently, those traits differ across individuals as individuals have different personalities.

Throughout the years, academics and psychologists have identified different models and frameworks to measure personality through traits. One of the pioneers of research on human personality, Gordon Allport, classified personality according to traits after finding out that there were more than 4000 words in the English dictionary that describe personality traits. He is one of the first theorists to define personality in the form of traits. Allport’s trait theory of personality identifies three types of hierarchically categorized traits: Cardinal traits which are considered rare but significantly determine the personality of an individual if present (strive for success e.g.); Central traits which are the considered commonly found traits that influence but do not entirely determine the behaviour of an individual (such as honesty, friendliness or compassion); and secondary traits which only appear in situations with specific context (a very outgoing person might change his/her behaviour into being irritable when a stressful situation occurs (Harvard University, n.d.; Cherry, 2019).

Another work in the field of personality research belongs to Raymond Cattell who built upon Allport’s trait theory as he decreased the number of personality traits by removing the uncommon and redundant factors as well as utilizing factor analysis. Cattell suggests 16 dimensions according to which a personality could be defined. These dimensions are as follows: *abstractedness, apprehension, dominance, emotional stability, liveliness, openness to change, perfectionism, privateness, reasoning, rule-consciousness, self-reliance, sensitivity, social boldness, tension, vigilance*, and *warmth* (Cattel and Mead, 2008).

Hans Eysenck also contributes to the academic field by measuring personality according to three dimensions – *introversion/extraversion*; *neuroticism/emotional stability* and *psychoticism* (Cherry, 2019).

In relation to Eyeseck’s and Cattell’s dimensions, Lewis Goldberg grouped personality traits into 5 dimensions, nowadays referred to as “the Big Five”. Further, in collaboration with Costa and McCrae, the version of the Big Five personality factors was adapted. These dimensions are classified as openness to experience, conscientiousness, extroversion, agreeableness, and neuroticism and tend to be one of the most used models to measure personality (Goldberg, 1992; Costa and McCrae, 2008).

Psychologists and other researchers have widely used this model due to its consistency. In their work Cobb-Clark and Schurer (2012) suggest that the Big Five personality traits are being stable for among working-age adults and there are only insignificant changes across groups in the mean-level stability which refers to

the extent to which personality scores change over time. Moreover, their results propose that non-cognitive skills are commonly identified as stable inputs into many economic decisions (Cobb-Clark and Schurer, 2012).

In this regard, *non-cognitive skills* could be defined as the "patterns of thought, feelings and behaviours" (Borghans, Duckworth, Heckman and Ter Weel, 2008, p.3). Non-cognitive skills include items such as perseverance, self-perception of ability, social competences, emotional maturity, interpersonal skills, etc. as they mainly encompass personal traits, attitudes, and motivations (Zhou, 2016). On the other hand, *cognitive skills* are "ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought." (Neisser et al., 1996, p. 77). However, McCrae and Costa (1994) suggest that personality traits are highly dissociated with cognitive skills.

Furthermore, in their work Barrick and Mount (1991) test the Big Five model in relation to job performance and personnel psychology across a variety of different work cultures (professionals, police, managers, sales and skilled/semi-skilled workers), including a sample size equal to almost 24,000 people. They proved that the model is a robust tool "…for formulating and testing hypotheses relating individual differences in personality to a wide range of criteria." (Barrick and Mount, 1991, p.23). Their research identifies that the trait of Conscientiousness was highly correlated with all of the work cultures examined as well as the three performance criteria that they identified. As for the other traits, the correlation to the studied sample groups and different criteria varied depending on the concrete trait.

2.3 Personality and technology acceptance

The correlation/relationship between personality and technology acceptance has been researched by a number of scholars in a variety of contexts. Devaraj, Easley and Crant (2008) suggest that significant factors that lead to technology acceptance are related to the Big Five personality dimensions. They theorized that the five personality traits would serve as moderators in relation to perceived usefulness and intention to use as well as have an effect on the perceptions about the usefulness, intention to use, and subjective norms. Their findings suggest that all factors but openness to experience have an effect on the technology acceptance factors (Devaraj et al., 2008).

In other studies, related to technology acceptance of social networking websites, Rosen and Kluemper (2008) found a significant relationship between some of the factors and PU and PEOU. Their results

indicate that Extroversion was positively related to both PEOU and PU and conscientiousness had a positive influence on PEOU. Moreover, Behrenbruch, Sollner, Leimeister and Schmidt (2013) conducted a study researching the technology acceptance towards a mobile event application and supported that extraversion has a positive effect on perceived usefulness.

Furthermore, Hamburger and Ben-Artzi (2000) indicated in their study that neuroticism had a positive effect on the use of specific social websites amongst women whereas extraversion had a negative effect. On the other hand, in the case of the men, neuroticism was negatively connected to the acceptance of social services on the internet, and extraversion had significant importance for the use of leisure websites.

In other studies, Barnett, Pearson and Kellermans (2015) were examining technology acceptance in the context of a web-based classroom technological system. Their results suggest that conscientiousness is positively connected with perceived and actual system use. On the other hand, neuroticism is also related to both actual and perceived usage but in a negative way. Moreover, contrary to their expectations extraversion had a significantly negative relation to system use. There was no significant relationship found between the rest of the traits and actual or perceived use of that technology (Barnet et al., 2015).

2.4 Personality in Human-robot interaction

In their work Salem, Lakatos, Amirabdollahian and Dautenhahn (2015a) hypothesized that personality traits like emotional stability and extroversion will have an effect on the user's perception of the robot and his/her willingness to collaborate with it. Their results suggest that people who are more extroverted tend to anthropomorphise robots (ascribe them humanlike traits) and also are prone to believe that robots have uniquely human qualities.

Moreover, a high level of emotional stability (which we can refer to emotional instability or neuroticism from the Big Five model) was also proven to have a positive correlation with anthropomorphising robots, and also such types of people felt psychologically closer to the robot (Salem et al., 2015a).

In another study, it has been identified that personality traits matter also in relation to preferences for robot appearances. Extroverts are more inclined to prefer humanoid robots whereas introverts prefer mechanoid robot appearance (Walters et al., 2009).

Furthermore, the study of Haring, Matsumoto and Watanabe (2013) yielded results indicating that there is a positive correlation between extroverts and trust in human-robot interaction. On the other hand, Salem et al. (2015a) indicated no such relationship between either extroversion or emotional stability towards trust.

Additionally, Gockley and Mataric (2006) studied what was the impact of the Big Five personality traits in humans towards a robot's ability to engage and motivate individuals to exercise. Results indicated that there weren't any substantial effects in relation to personality traits. However, extroverts were found to be more acceptable towards the robot entering their personal space.

2.5 Embodiment and anthropomorphism

Another important stream of research regarding robot acceptance and human-robot interactions concerns the issue of physical embodiment. Unlike utility robots that are performing labour-intensive work which requires physical embodiment as, for example in manufacturing (delivery and product assembly), military operations (bomb defusal robots, tale-surveillance), household chores (robot-mowers, cleaning robots), etc., other types of robots do not necessitate physical embodiment to perform social, educational or entertainment tasks. Instead, such robots may achieve their purpose and interact with humans in both *embodied* and *disembodied* ways as the interaction is not directly related to the execution of some physical activity (Lee, Jung, Kim and Kim, 2006).

Furthermore, Lee et al. (2006) find strong evidence that physical embodiment in social robots affects positively the evaluation of the robot agent, the feeling of the robot's agent social presence and the evaluation of the interaction with the robot. The question of whether or not a robot should be physically embodied and whether or not such embodiment improves human-robot interactions is fundamental especially to industry practitioners due to the high cost of manufacturing a physical body as compared to virtual robots that can be tale-present when engaging with the users.

Furthermore, Wainer, Feil-Seifer, Shell and Mataric (2007, p.872) demonstrates that physically embodied robots are "perceived as more appealing and perceptive of the world than non-embodied robots". Additionally, it has been confirmed that participants in the study perceived the embodied robots as more helpful, enjoyable to interact with, and watchful in comparison to a remote telepresent or simulated robot (Wainer et al., 2007). Therefore, the issue of a physical embodiment should be taken into account in virtually any research concerning human-robot interaction as it can play an important role in people 's perception. Moreover, physically embodied robots are able to invoke greater emotional responses such as

empathy (Kwak, Yunkyung, Eunho, Shin and Kwangsu, 2013) as opposed to disembodied robots meaning that they are perceived to be more human-like and not so much as inanimate objects. Nevertheless, the research on that matter is not conclusive as according to Bartneck and Forlizzi (2004) robotic embodiment has no more significant effect on people's emotions than virtual agents.

One more noteworthy characteristic in human-robot interactions is that people are more likely to follow instructions and afford more personal space to physically present robots as opposed to video-present or virtually simulated robots (Bainbridge, Kimm and Scassellati, 2008).

Another important approach to enhance the level of robot acceptance is to increase the perception of familiarity by incorporating anthropomorphic (humanlike) design and building human social characteristics and behaviour into it. This includes issues such as the robot's physical shape, the use of social cues and facial expressions as well as speech, gestures, etc.

One of the most obvious and important attributes that shape the human-robot interaction and respectively determine if the robot will be accepted or rejected by the user, is physically visible design. Thus, this issue has been a major concern point for academics, designers, and practitioners (DiSalvo, 2002; Bartneck, Reichenbach and Breemen, 2004). For instance, research validates that there are noticeable differences in the way people perceive robots with non-anthropomorphic as compared to robots with anthropomorphic design, especially when the robot is supposed to engage and interact with the user. Despite the lack of concrete evidence and theoretical precision, the theory suggests that while a certain level of physical realism, achieved by building anthropomorphic features, can be beneficial it can also lead to negative consequences (Feil-Seifer and Mataric, 2008). This effect is known as the *uncanny valley effect* which emerges in a situation where the robot imitates human features and appearance to a very high degree but not completely. The effect occurs when a robot looks a lot like a human being with the exception of some unnatural features. This creates a feeling of eeriness and unnaturalness which hinders the achievement of successful interaction.

However, it is important to acknowledge that there is no clear manual on how to avoid this negative effect when building a robot. Moreover, the uncanny valley effect can affect the different dimensions of the interaction in various ways. For example, a study conducted by Kanda, Miyashita, Osada, Haikawa and Ishiguro (2008) employing the humanoid robots ASIMO and Robovie concluded that the difference in their appearance did not lead to different verbal behaviour from people towards the robots, but nevertheless affected some aspects of people's non-verbal behaviour, namely the distance kept from the robot and delay of responses.

Unsurprisingly literature suggests that the robot head and facial features affect to the highest degree how humanlike the appearance of the robot is evaluated to be, due to the fact that the face is the body part that receives the most attention in human to human interactions. In relation to this, DiSalvo, Gemperle, Forlizzi and Kiesler (2002) found evidence that the mouth, eyelids, and nose as well as the width of the head are the most vital attributes responsible for the perception of humanness in robots. Overall, academia agrees that the physical shape and embodiment of a robot influence the way in which users interact and perceive the technology. However, there is no universal agreement and accepted guideline on how to design robots in the most appropriate way, as individual preferences, demographic factors, cultural factors and the context in which a robot operates influences the human-robot perception and interaction (Kaplan, 2004; Bartneck, Nomura, Kanda, Suzuki and Kato, 2005).

3.Theoretical framework

3.1 Technology Acceptance Model

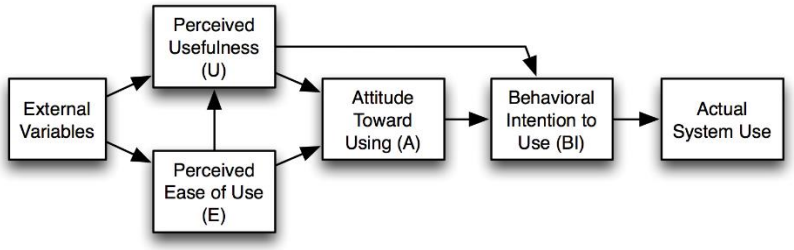


Figure 2 Technology acceptance model source: Davis, Bagozzi & Warshaw 1989

One of the theories that will be included in the theoretical framework for this study is the Technology Acceptance Model (TAM). It was introduced by Davis (1989) and it aims to predict and explain how individuals accept and use certain technology (the model is shown in figure 2 above). The model identifies *actual system use* as the dimension in which the users would have accepted the technology in questions. However, to achieve that stage, users have to shape their bihavioural intention to use (BI) which is

determined by the attitude of the individual (A) and his/her perceived usefulness (PU) of the technology (Davis, Bagozzi and Warshaw, 1989). Moreover, the attitude is also affected by two factors that have significant importance when forming acceptance behaviours namely perceived usefulness and perceived ease of use (PEOU).

3.1.1 Perceived Usefulness

According to Davis (1989), perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance." which stems from the definition of the word useful: "capable of being used advantageously." (Davis, 1989, p.320). PU has a direct relationship with BI due to the fact that in organizational settings enhanced performance is a significant determinant of achieving extrinsic rewards such as pay increase or promotion. Forming such intentions is based on the cognitive appraisal of how technology will improve your performance, thus it is theorized that people will form their intention to use a specific technology based on those cognitive appraisals (Davis et al., 1989). Hence, by applying this to the context of robot acceptance in yoga, we hypothesize that:

H1: Perceived usefulness (PU) has a positive effect on BI.

3.1.2 Perceived Ease of Use

Perceived ease of use is referred to as "the degree to which a person believes that using a particular system would be free of effort." Originating from the definition of "ease": "freedom from difficulty or great effort."(Davis, 1989, p.320). In the original study by Davis (1989), he identified that both PU and PEOU are both significant factors that lead to technology usage where PU is indicating a stronger effect on the actual intention to use. Davis et al. (1989) propose that PEOU is further determined by two other elements: self-efficacy and instrumentality. The idea behind including self-efficacy as a determinant to PEOU is that the lower the level of complexity required to operate with technology, the higher would be the individual's sense of control and efficacy. Thus, efficacy is suggested to be one of the key elements to provoke intrinsic motivation which is meant to be measured in the correlation between PEOU and BI (Davis et al., 1989). Therefore, we hypothesize that:

H2: Perceived ease of use (PEOU) has a positive effect on BI

Moreover, PEOU could also lead to increased performance in the sense that individuals put less effort into using a system which then allows them to achieve a higher workload for the same amount of effort (Davis et al., 1989). Thus, creating an instrumental improvement and we hypothesize that PEOU also influences PU positively:

H3: PEOU has a positive effect on PU.

3.2 Big Five Personality Traits

As mentioned in the Literature review section above, the technology acceptance model is applied in various contexts in regard to personality traits as determinants of PU and PEOU. Consequently, in our paper, the aim of the research will be the relation between the Big Five personality traits and technology acceptance of yoga practitioners. In our case, the new technology implemented will be the Alpha 1 Pro robot.

Therefore, we extend the model by identifying the external variables that influence PU and PEOU to consists of human traits according to the Big Five model. These traits include openness to experience, conscientiousness, extroversion, agreeableness, and neuroticism. Below, we will provide descriptions of each trait as well as develop hypotheses in accordance.

3.2.1 Openness to experience

This trait is related to describing imagination and intellectual curiosity (Power and Pluess, 2015). It is associated with features such as "being imaginative, cultured, curious, original, broad-minded, intelligent, and artistically sensitive" (Barrick and Mount, 1991, p.5). People who score high on this dimension tend to be more creative and open towards trying new experiences in comparison to people who do not possess this trait as they are being resistant to change and tend to dislike abstract ideas (Soldz & Vaillant, 1999). Research also shows that openness to experience is linked to intellectual skills and knowledge as well as it may increase over time (Schretlen, van der Hulst, Pearlson, & Gordon, 2010). Thus, this leads to a higher possibility for skills and knowledge development as people will have more experiences to take advantage of as they age. In relation to that, we would like to hypothesize that individuals who exhibit a higher level of openness towards new experiences will be more accepting of new concepts and technologies in the teachings and practice of yoga:

H4: Openness to experience has a positive effect on PU

H5: Openness to experience has a positive effect on PEOU

3.2.2 Conscientiousness

Conscientiousness can be related to the individual's self-control, the inclination to act acceptable in social settings as well as to adopt behaviours which are goal-oriented (John and Srivastava, 1999; Muller and Richert, 2018). Moreover, conscientiousness is a trait that "reflects dependability; that is, being careful, thorough, responsible, organized, and planful" (Barrick and Mount, 1991, p4). Individuals who tend to score high on this trait are also hardworking, achievement-oriented, preserving, and organized as well as they tend to seek effective job performance (Barrick and Mount, 1991; Power and Pluess, 2015). Furthermore, our hypothesis in relation to conscientiousness will be as follows:

H6: Conscientiousness has a positive effect on PU

H7: Conscientiousness has a positive effect on PEOU

3.2.3 Extroversion

This dimension identifies the difference between the two contradictory elements – extroversion and introversion. Extraversion tends to describe inter-personal behaviour (Muller and Richert, 2018). Also, extroversion is related to feeling positive emotions like gregariousness, and extroverts tend to seek out social stimulation (Power and Pluess, 2015). Furthermore, Barick and Mount (1991, p.3) describe extroverts to be "sociable, gregarious, assertive, talkative, and active". On the other hand, introverts tend to not spend a lot of energy in social settings and act more reserved due to the fact that they prefer solitude and dislike being the center of attention. Moreover, in a 45-year longitudinal study, Soldz and Vaillant (1999) found that this trait is fairly consistent over time and individuals do not tend to change their personality to the opposite state in terms of extroversion/introversion. Therefore, we are interested to research what type of people will be more acceptable towards using a robot in their yoga practice. Hence:

H8: Extroversion has a positive effect on PU

H9: Extroversion has a positive effect on PEOU

3.2.4 Agreeableness

Agreeableness could be defined as the tendency to be compassionate and cooperative towards others (Power and Pluess, 2015). Personality traits that are linked to people who score high on this dimension "include being courteous, flexible, trusting, good-natured, cooperative, forgiving, soft-hearted, and tolerant." (Barrick and Mount, 1991, p.4). It differs from extroversion, as agreeableness is related to an individual's way of interacting with others whereas extraversion is related to seeking interactions with others and an individual's levels of energy in those interactions. People who score high in the dimension of agreeableness are more sympathetic, kind, and affectionate to others and are more open towards helping, cooperating, and sharing with others, as well as volunteering, generally adopting prosocial behaviour (Lebowitz, 2016). On the other hand, people with low scores in agreeableness are less trustable and likeable by others as they tend to be more rude, sarcastic, and ill-tempered in general. We hypothesize here that people who are more agreeable will be more acceptable towards the implementation of robots in yoga due to fact that their traits such as flexibility, kindness, affection, cooperativeness, and tolerance could be applied also towards the robot. Thus:

H10: Agreeableness has a positive effect on PU

H11: Agreeableness has a positive effect on PEOU

3.2.5 Neuroticism

The trait of neuroticism is also referred to as emotional stability, hence referring to the level of emotional stability of an individual. People who are high in neuroticism are associated with negative emotions such as "being anxious, depressed, angry, embarrassed, emotional, worried, and insecure." (Barrick and Mount, 1991, p4). In comparison, individuals who are low in neuroticism tend to be more confident in themselves, emotionally stable and relaxed.

In their study Judge, Erez, Bono and Thoresen (2002) identified that neuroticism was negatively correlated with factors like self-efficacy, self-esteem, and locus of control (the feeling of an individual that he/she has control over his/her life). Moreover, it was suggested in the paper that there is a negative association of neuroticism to exercise which could be related to our context of yoga (Judge et al., 2002). Furthermore, lower goal-setting and self-efficacy motivation, as well as job performance, are associated with the neuroticism trait (Judge and Ilies, 2002).

In addition, the above mentioned 45-year longitudinal study Soldz and Vailant (1999) identify a negative relation between neuroticism and healthy adult adjustment to life and a positive one between neuroticism

and mental health problems as well as smoking, alcohol and drug abuse. In general, this could also be assumed to have a negative effect on the willingness of individuals to participate in yoga practices as well.

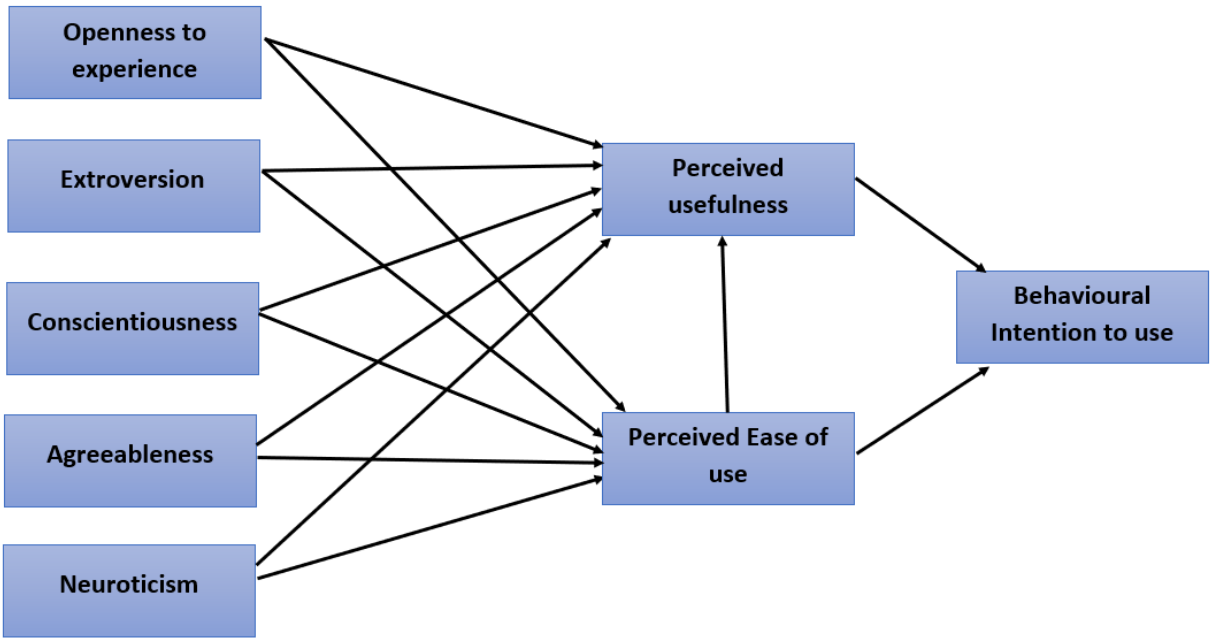
Consequently, we hypothesize that in our research neuroticism will have a negative correlation to the acceptance of robots in the context of yoga due to the individuals' emotional instability and insecurity in his own capabilities to operate with the new technology:

H12: Neuroticism has a negative effect on PU

H13: Neuroticism has a negative effect on PEOU

In accordance with the formulated hypotheses we have provided a proposed model below:

Figure 3 Proposed extended TAM source: own



4. Methodology

4.1 Philosophy of science

The following section aims to elaborate on the main methodological considerations within our paper and furthermore provide justification for the implementation of a particular research design. To achieve this goal, we begin by discussing the *philosophy of science* dimension which determines what kind of knowledge can be produced and what kinds of methods and strategies could be utilized to complete our study objectives. Thinking within the paradigm of a specific philosophy of science influences greatly the choice of methodology, choice of concepts, choice of data, choice of literature, structuring of the thesis, etc. Because of which it is of the utmost importance to conduct such a discussion and clarify the logic behind the above-mentioned choices that we have made and what is their fit with the selected epistemological approach.

This paper follows the logic of *Critical Rationalism* which is an epistemological philosophy advanced to a great degree by Karl Popper (Holm, 2013). Popper's philosophy of science was an alternative and critique of the established positivists' rules for scientific conduct. These rules could be summarized by the methodological idea that all scientific theories must necessarily abide by the logic of inductive research (Holm, 2013). Popper (1974) believed that while positivists may have provided the wrong answer, they nonetheless ask the right question namely*:* What should the criteria be for something to be established as scientific theory and science?

Similarly, to the positivists, Popper considered the establishment of criteria for distinguishing between science and non-science to be a responsibility of the philosophy of science. The question of what those criteria should be is referred to as *the problem of demarcation* (Popper, 1974). However, the problem of demarcation is understood in a significantly different manner by Popper in comparison to the positivists. For example, positivists argued that only sciences should be seen as a source of knowledge, while religion and metaphysics have no scientific value as they are concepts outside of the human perception and ability to observe which renders them useless prepositions to investigate. On the other hand, Popper was of the completely opposite opinion as he argued that unscientific theories can easily turn out to be correct in the same way scientific ones can prove out to be false. In fact, according to Popper unscientific theories can be very meaningful and of great importance. Furthermore, Popper (1974) explains that unscientific theories can very well become scientific in the same way astrology developed into astronomy with time.

Moreover, Popper (1974) had a strong disagreement with the criteria cherished by positivism and its methods for acknowledging something as knowledge and respectively science. Those criteria lead to the emergence of what he referred to as pseudoscience. For example, according to him, positivists were not able to justify the rejection of astrology as true science since its theories are based on empirical observations of the stars and celestial bodies. Therefore, astrology practitioners can find abundant amounts of "proof" to support their claims. Logically one must consider that if such pseudosciences are able to pass the criteria for being scientific under the positivist paradigm, then positivist standards must be incomplete or flawed. This simply means that even if a theory can be proven that does not make it scientific.

As a consequence, Popper (1974) rejected the ideas of verificationism advanced by positivism as well. The issue he pointed to is that very often a proof of a theory can be found if a proof is what one looks after due to confirmation biases. Astrology could rather easily be validated if someone wants to believe its empirical observations. Moreover, if a theory is badly defined and vague in its predictions it becomes much easier to find "proof" for it. In the same manner, the vague predictions which we read in horoscopes seem to be accurate representations of people's life's due to their imprecision and ability to fit different situations.

As we already mentioned, Karl Popper's (1974) rejection of positivism belief that induction should be seen as the hallmark of science is central to the development of critical rationalism as an epistemological framework. According to him, there are both logical and practical issues with such an approach. First, from a logical standpoint past observations can never make proclamations of truth or revelations about what future studies might find out to be true at a later stage. The *black swan metaphor* is appropriate to exemplify this logical issue. The metaphor argues that just because one might have seen only white swans in his life it is a fallacy to assume that black swans do not exist. Therefore, induction cannot be a way to reach certain knowledge as even if all of the observations produce the same result there is always the possibility that the next observation will lead to a different outcome and conclusion.

Secondly, the practical problem with positivism is based on the premise that in reality observations are never the starting point of scientific conduct (Popper, 1974). The idea of pure observations put on a pedestal by positivism is simply flawed. According to critical rationalism, observations will always start with a certain idea, level of understanding, and expectations in regard to what is going to be studied (Holm, 2013). A biologist, for instance, will not begin purely observing a group of animals. Instead, there will be a clear concept in place about what he/she desires to observe beforehand, why a particular animal behaviour is relevant to the observer, and how the results/data fit into the research as a whole. Obviously, this way of thinking in Critical Rationalism puts the formulation of a theory as the base of scientific conduct as opposed

to a final outcome of research as understood by positivism. Following this paradigm, we structure our research by first formulating a new theory that expands the model of Technology Acceptance (Davis, 1989). In particular, we theorize that the big five traits of human personality might affect the attitude towards robotic technology which will respectively determine the nature of the human-robot interaction.

Moreover, the above-mentioned example of biologist's scientific endeavours creates a new understanding of the nature and purpose of observations. Consistent with the positivistic paradigm a researcher should be as passive as possible in order to avoid influencing the results of his/her research. On the contrary, Critical Rationalism advocates for active participation and purposeful observations.

Additionally, critical rationalism is characterized by the fact that the fundamental purpose of science becomes falsification and disapproval of a theory (Popper, 1974). Essentially falsificationism is the opposite of verificationism. It is the view that science does not aim to prove a theory but rather to disprove it. This is achieved by devising tests that can demonstrate the incorrectness of your theory. If the theory passes the test it is regarded as valid.

Therefore, Popper's (1974) answer to the problem of demarcation is that as long as a theory can be tested in practice it qualifies as scientific. Consequently, Critical Rationalism defines what makes a scientific theory good and accurate: a scientific theory should not be based on educated guesses about reality. Instead, the formulation of a theory should be such as to include clearly and precisely defined observations in the form of hypotheses that will falsify it. Therefore, within our research, we further devise two sets of specific hypotheses. The first set of hypotheses theorizes about correlations between the big five personality traits and the dimensions of the perceived usefulness and perceived ease of use which the Technology Acceptance Model (Davis, 1989) demonstrates to influence the actual behaviour towards technology. We expect that these personality traits would affect people's perception regarding the PU and PEOU of edutainment robots. The second set of hypotheses targets the inner relationships of the Technology Acceptance Model as we aim to investigate whether or not PU and PEOU dimensions have the same relationship to Behaviour Intention (BI) in the context of edutainment robots the way previous literature suggests they should.

Moreover, in numerous studies, the attitude towards use has been excluded from the theoretical model. This is the case because it has been empirically verified that perceived ease of use and perceived usefulness influence directly Behavior intention, which justifies the exclusion of the Attitude towards Use dimension (Devaraj et al., 2008). Moreover, Davis et al. (1989) reach the conclusion that attitudes have relatively little effect mediating between perceptions and intentions to use. Therefore, we have not included questions regarding the attitude towards use in our survey as it would have made it unnecessarily longer, possibly

leading to fewer responses. The sets of hypotheses that we have devised describe our explicit expectations about the outcome of our study which is further based on previous theory.

Furthermore, Critical Rationalism Is a philosophy of science that is rationalist because it utilizes deductive reasoning, even though deduction here is used in a slightly different manner than in classical rationalism (Holm, 2013). For classical rationalists' deduction is a way of acquiring knowledge through non-empirical means. Popper, on the other hand, utilizes deduction as a method to make the step from theory to hypothesis (Popper, 1974). This means that under critical rationalism the starting point is still non-empirical in the form of the proposed theory, but deduction is applied in the process of hypothesis formulation that must be subject to empirical tests. The same logic is followed in this paper as we begin with the suspicion that personality traits might affect human-robot interaction, based on which we deduce hypotheses for each personality trait separate hypothesis which will mathematically prove or disprove any such correlations.

More practically speaking, the reason for devising hypotheses is that they can be later tested in an experiment unlike the theory itself (Holm, 2013). This method of testing leaves us with two possible outcomes. In the first scenario, the result will prove consistent with the theory, in which case the proposed theory will be validated. In the second scenario, the results will be inconsistent with the theory hence disproving and falsifying it. Consequently, this will point to a need for a newer and better theory.

4.2 Experiment design

In accordance with this characteristic of Critical Rationalism, we have designed an experiment to test our hypothesis. First, for the purpose of the experiment we have purchased the humanoid edutainment (domestic) robot Alpha 1 pro via the internet from the webpage *happii.dk*. This robot has the capability of performing various yoga moves and postures in accordance with which we have devised our experiment. Afterwards, a short 5 minutes video of the robot giving instructions to the viewer on how to perform the various yoga moves was created. The experiment was designed in such a way as to simulate a "regular" online yoga class, led by a robot teacher instead of a human one. Taking into consideration the context of the experiment within which participants had to engage in physical activities it could be perceived as advantageous that subjects had the opportunity to participate from the comfort of their home and go at their own pace with the robot. This mimics the real-life situation where Alpha 1 Pro might be used by consumers.

The video was followed by a questionnaire where subjects had to answer self-reporting questions in regard to their personality, experience with the robot Alpha 1 Pro, and judgement about the technology.

Moreover, the short video which represents a 5-minute yoga lesson was created with the use of OpenShot Video editor. The software was used to combine the different scenes that were recorded together with the audio and a few effects. The moves and positions which are shown in the video were either programmed using the official Alpha 1 Pro PC software provided by UBTECH or downloaded from an existing library with pre-programmed actions (some of which were also reprogrammed in order to better fit our desired position). Moreover, the audio instructions in the video are recorded as a voice-over which was created with the help of a voice generator as we aimed to recreate the voice of Alpha 1 Pro to best fit the narrative of the video lesson.

4.3 Data collection method

The results of our thesis are based on findings that are obtained utilizing a primary data collection method in order to put the above-constructed hypotheses to tests. We have adopted a quantitative method for data collection. It could be described as "entailing the collection of numerical data, as exhibiting a view of the relationship between theory and research as deductive and a predilection for a natural science approach (and of positivism in particular), and as having an objectivist conception of social reality." (Bryman, 2012, p.160).

Our approach is conducted through the use of surveys and more specifically self-completion questionnaires also named self-administered questionnaires. Such type of questionnaires is normally used to gather data in exploratory studies such as this one where we are trying to observe and clarify relationships between different variables (Saunders, Lewis and Thornhill, 2009).

Moreover, according to Saunders et al. (2009) questionnaires are not a good fit for researches where a high amount of data is needed to be acquired through open-ended questions. Thus, on the contrary, questionnaires are an adequate tool to gather data when their design includes standardized questions that are going to be interpreted in the same way by all respondents (Saunders et al., 2009). This is in accordance with our goal to produce a focused paper where we aim to gather information and explore specific variables as well as find correlations between them and test the above-mentioned hypotheses.

Additionally, there are other advantages of self-completion questionnaires in comparison to other research techniques. Such questionnaires are quicker to administer as they can be sent out instantly through e-mail or regular mail (Bryman, 2012). In our case we have used the Internet to distribute our questionnaires as it is very time efficient in comparison to personal interviews, for instance, having in mind that we have a sample size of about 70 respondents and the deadlines for completing this student thesis is also time-sensitive. Also, such online questionnaires do not require any funds to be dispensed as we have sought for and approached our respondents online, mainly utilizing a social networking site.

Furthermore, by the use of self-administered questionnaires, we have eliminated the effect that an interviewer might have on the responses that the participants provide. Bryman (2012) suggests that in some studies it has been found that the personal characteristics of an interviewer such as ethnicity, gender, and social background may have an effect on the given responses. In addition, respondents are much less likely to express social desirability bias which "reflects the tendency on behalf of the subjects to deny socially undesirable traits and to claim socially desirable ones, and the tendency to say things which place the speaker in a favorable light", thus avoiding to provide accurate answers (Nederhof, 1985, p. 264). We believe that this is a significant factor for our questionnaire as it requires the respondents to present personal information in their answers. One part of the survey includes questions about personality traits that measure the personality of each individual whereas the other part is related to personal opinion on the usefulness, ease of use as well as the overall acceptance of robots in the context of yoga. Hence, to obtain the most unbiased answers we have utilized the self-administered questionnaires which people can answer in a convenient place, time, and speed for them.

On the other hand, there are also some disadvantages of self-completion questionnaires which could relate to this study. One of them is that respondents could experience difficulties when answering questions in terms of unambiguity or unclearness of questions and instructions to complete the survey (Bryman, 2012). In our case, we have adopted questions from the International Personality Item Pool in order to measure the personality as well as we have borrowed and adapted questions regarding the usefulness and ease of use of the robot from relevant literature. Hence, we have based our survey on already established and previously tested question items in the Information systems and psychology literature in order to mitigate the difficulties that respondents might occur when understanding the questions. Moreover, a thorough explanation of the research idea, questionnaire aim, and scope, as well as instructions, were provided during the initial communication with the respondents.

Furthermore, other drawbacks of using a questionnaire include the fact that is not possible to ask additional or different questions, questionnaires could be read as a whole before answering the questions inside, thus lowering the undependability of each question and there is a greater risk of missing data (Bryman, 2012).

An additional restraint which prevented us from supplementing our research with an additional research method was the situation that arose in relation to the outbreak of Coronavirus disease (COVID-19). The virus was first identified in December 2019 in China and since then it has spread globally forcing many countries to go in a state of isolation in order to prevent the pandemic. This led to restrictions of physical human contact which on its turn limited us in conducting a real experiment which will be mentioned further in the paper as well as including other forms of research approaches than online questionnaires.

4.4 Secondary data

Secondary data was also utilized in our study. We have sought a number of academic materials related to the topic of this research. Such materials include academic articles, journals, and books on different topics such as: “technology acceptance”, “automation”, “social human-robot interaction”, “robot acceptance”, “human personality”, “impact of personality on technology acceptance”, e.g. These materials were mainly obtained through search engines like “Google” and “Google Scholar” with the use of applicable keywords. Also, the online library of Copenhagen Business School was utilized for finding relevant literature. Moreover, sources of information regarding the Alpha 1 Pro robot and the overall robot market were obtained through online desk research.

4.5 Questionnaire design

The questionnaire which we used to collect data for our research was created with the use of an online tool named “Google Forms”. It is a tool which allows you to create and collect responses through surveys, quizzes, and questionnaires online. The questionnaire itself consists of 62 questions. The first three questions are related to the gender, age, and degree of education, followed by 50 questions in relation to the Big Five personality traits. There are 10 questions each respectively divided into each of the 5 traits (Agreeableness, Openness, Conscientiousness, Neuroticism, and Extroversion). The questions regarding personality traits are borrowed from the official website for the International Personality Item Pool which includes over 3000 items (IPIP, 2019). Moreover, the website itself contains different already established

and validated inventories of questions regarding the 5 traits. In our research, we have implemented the multiple-construct NEO-PI-R inventory by Costa and McCrae (1992) which includes a 10-item scale for each personality dimension.

The rest of the questions in the questionnaire are in regard to the other theoretical framework which this research is based on the Technology Acceptance Model. Three groups of questions were asked in regard to TAM's dimensions namely *perceived usefulness*, *perceived ease of use*, and *behavioural intention to use*. The questions are borrowed from relevant information-system literature and are modified to better illustrate the three dimensions mentioned above in the case of the robot which is used in this study (Wu and Wang, 2005; Van der Heijden, 2004; Park, 2009).

The type of data variables that are collected are mainly attribute variables which are distinguished by providing data about the characteristics that an individual possesses. They are "…used to explore how opinions and behaviour differ between respondents as well as to check that the data collected are representative of the total population" (Saunders et al., 2009, p.368). In contrast, there are also opinion variables, which are recording respondents' feelings or opinions about a particular topic, and behavioural variables which include respondent's past, present, or future actions and behaviours (Saunders et al., 2009).

The measurements of all of the questions were recorded through the use of a Likert scale. Nowadays, it is one of the most commonly used multiple-item measures which aim is to identify the level of intensity of the individual's feelings towards a certain topic or question (Bryman, 2012). According to this scale, individuals should indicate their opinion towards the subject in question on a five or seven-point scale which is also the case in our questionnaire. We have provided the respondents with the opportunity to express their beliefs on a five-point scale with the following measures: "1 – *Very inaccurate*", "2 – *Moderately inaccurate*", "3 – *Neither inaccurate nor accurate*", "4 – *Moderately accurate*", and "5 – *Very accurate*". Moreover, all of the questions are presented in the form of statements where respondents are asked to evaluate themselves and their understandings in order to match the construct of the chosen measurement scale.

The layout of our questionnaire is simple and consists of 2 sections. The first one includes a short description of the instructions for completing the form and the second part represents the questions themselves. The background of the survey is in a soothing blue color whereas each of the questions is separated in a white-colored box in order to standout which makes the layout clear and easy on the eye. According to Dillman, Smyth and Christian (2009), this could have a positive effect on the respondents' answering rate. Moreover, consistency of fonts and font sizes is kept throughout the whole questionnaire.

Furthermore, the placement of the closed answers is vertical to create a more clear distinction between the question and the answers as well as reduce the risk for wrongly answered questions (such as indicating moderately accurate when respondent meant very accurate if he/she was in a hurry e.g.) (Bryman, 2012).

4.6 Sampling and distribution

The population which is considered for our research represents all the yoga practitioners in Denmark. Nevertheless, it is impossible for us to gather information from all of them. Therefore, we have chosen to approach two of the biggest online communities of yoga practitioners in Denmark on Facebook. We have targeted the two biggest Danish groups of people named "Alt om YOGA" and "JEG ELSKER YOGA" with 9,439 and 2,732 current number of people respectively which formed our revised population.

In our sampling approach, we have combined both snowball sampling and convenience sampling techniques which are both parts of non-probability sampling. Non-probability sampling refers to the fact that the probability for each case from the total population to be selected and included in the sample size is unknown (Saunders et al., 2009). Convenience sampling is characterized by the sample being extracted from the population due to its accessibility (Bryman, 2012). In our case, we have approached the two online Yoga communities mentioned above due to the fact that they provide a high level of accessibility to a big number of people which represent part of the Danish Yoga practitioners. However, the collected responses were from people who have decided to enter our experiment on their own wish.

Furthermore, with snowball sampling, the researcher initially approaches a small number of people relevant to the study which are later used to establish contacts with other potential participants. This has also been utilized as we have contacted yoga teachers and students that we know personally to participate in our research and some of them have also encouraged their yoga peers to take part in this study. These techniques are applied due to the authors' time limitation as well as restraints to access relevant sources of information.

In our case, we have reached a sample size of 70 people as this is the number of the valid surveys, we have received responses to. 15 of the answers are acquired from snowball sampling and the rest of the respondents are from a convenience sampling approach.

The distribution of the questionnaire and the video for our experiment was done online as mentioned above. Facebook posts were written explaining the aim of the study and providing instructions regarding the questionnaire. Moreover, both the video capturing the robot moves and the questionnaire were included in

the post as separate links to follow. The posts were systematically posted in each group for a month, creating a post every week starting from the 15th of March up until the 15th of April, amounting up to 12 posts overall.

4.7 Analysis of data

The collected primary data for this research is quantitative therefore, we had to conduct statistical analysis of the questionnaire data. For this purpose, we have obtained SPSS software including SPSS Statistics and SPSS Amos. SPSS Statistics is currently produced by IBM and is one of the most widely used pieces of software for carrying out statistical analysis in social science. It includes a variety of features to aid the user when dealing with different types of analysis such as ad hoc analysis, hypothesis testing, geospatial analysis, or predictive analytics (IBM, n.d.).

SPSS Statistics will be utilized to first re-code our data. Since it is recorded on the scale from "Very inaccurate" to "Very accurate" we had to recode these statements in order for them to have numerical values which we could use in further analysis. Furthermore, we have conducted a Factor analysis in order to find out which questions have the highest factor loading for each of our constructs (the five personality traits and constructs related to technology acceptance – perceived usefulness and ease of use as well as behavioural intention to use). Items with factor loading lower than .70 were removed due to insignificant relation. Moreover, descriptive statistics will be included showing relations between different variables as well as notions such as Kaiser-Meyer-Olkin measure of sampling adequacy, Bartlett's test, and Cronbach's Alpha will be further explored in order to identify the validity and reliability of our data.

Additionally, we will carry out a one-way ANOVA analysis of variance. It will provide information about the different groups of respondents that we have and their differences in answers according to how spread the data is within and between groups by comparing the mean values. The F-value in the ANOVA tables presented in the Appendix section represents the differences between and within groups. Also, the p-value of significance will indicate if the differences are statistically significant at the 0,05 level (Saunders, et al., 2009).

Furthermore, SPSS Amos software will be used in order to carry structural equation modeling. Structural equation modeling is a type of analysis which is conducted to analyze structural relationships. Hence, in our case we are interested in investigating what are the relationships between each of the personality traits and perceived usefulness and ease of use as they lead to the intention of the user to accept and actually use

the robot. Thus, after we have carried out a confirmatory factor analysis in order to define our constructs, we conduct a path analysis using the Amos software. Path analysis is referred to as an analysis which provides the relationships between a set of variables. In the case of structural equation modeling, the variables are exogenous (independent) and endogenous (dependent). Hence, we are able to find out the relationships between the hypothesized items and either confirm or reject our hypothesis.

4.8 Reliability and Validity

4.8.1 Reliability

Reliability is related to the issue of how consistent the measures are. *Internal reliability* is one of the attributes of reliability and refers to the consistency of the indicators that represent the measuring scale in the research (Bryman, 2012). Internal reliability is identified in multiple indicator measures due to the fact that whenever a respondent is asked to rate a construct that is assessed by the combined score of multiple indicators, the possibility that those indicators are not measuring the specific construct is increased (Bryman, 2012). In order to test the internal reliability of our data, we will conduct the Cronbach's alpha test which is associated with the scores that could be derived from a scale or aggregated score. This test will be conducted in SPSS for each of the different constructs present in our study. The Cronbach's alpha score ranges from 0 (indicating no internal reliability) to 1 (indicating perfect internal reliability). There is a debate amongst academics which value between 0 and 1 is acceptable to represent satisfactory internal consistency but the most accepted values are above either 0.7 or .08. Below a table with Cronbach's alpha scores for each of the constructs examined in our data will be presented.

Moreover, the notion of *stability* is also part of reliability. It refers to the consistency of data across time, also known as test-retest reliability where the goal is to obtain the same results if a study is duplicated at a later moment in time. In our case, we cannot apply a test-retest approach due to certain limitation, nevertheless, the measures of personality traits have been tested and studied in multiple studies and are proven to be stable. A good example is the longitudinal study mentioned earlier by Soldz and Vaillant (1999). In it, personality traits of 163 men have been tested in the course of 45 years through repeated interviews and questionnaires using the NEO-PI-R scale which is also applied in this study.

4.8.2 Validity

The notion of validity is related to the integrity of the conclusions that are produced from this research. Validity is divided into measurement validity, internal and external validity (Bryman, 2012).

Measurement validity

Measurement validity "… refers to the issue of whether an indicator (or set of indicators) that is devised to gauge a concept really measures that concept" (Bryman, 2012, p.171). In our case, we have implemented 5 trait dimensions of personality as well as technology acceptance as concepts to be measured. As mentioned above, we have applied Costa and McCrae's (1992) NEO-PI-R Domains in order to measure the personality of our respondents. The inventory items that are used in our research are implemented in a variety of other pieces of research that measure personality based on NEO-PI-R scale as well its validity, therefore proving the scale to be valid predicament of personality (McCrae and Costa, 1992; Schinka, Kinder and Kremer, 1997; Young and Schinka, 2001; Conrad, 2006; Korukonda, 2007; Cano-García, Padilla-Muñoz and Carrasco-Ortiz, 2005).

The same logic should be applied for the constructs of technology acceptance that we measure. The indicators that we have used there are adopted from different papers in the information-system literature, some of them also include tests on validity and reliability of the scale items (Davis, 1989; Moon and Kim, 2001; Van der Heijden, 2004; Wu and Wang, 2005; Park, 2009; Pai and Huang ,2011; Abu-Dalbouh, 2013)

Internal validity

Internal validity is associated with the problem of knowing what caused the relationship between two or more variables and whether the relationship is valid (Bryman, 2012). It is referred mainly to the topic of causality. In the case of this research, the internal validity would raise the question of whether personality traits really are predeterminants of technology acceptance towards robots. Our initial understanding that these two variables correlate is based on empirical evidence provided in the past and current information-systems literature (Devaraj et al., 2008; Svendsen, Johnsen, Almås-Sørensen and Vittersø, 2013; Özbek, Alnıaçık, Koc, Akkılıç, and Kaş, 2014; Rosen and Kluemper, 2008; Behrenbruch et al., 2013). Hence, we believe to have a significant level of internal validity.

However, no research is done on the acceptance of robots within the context of yoga. Therefore, there might be other factors that are not considered in this paper such as a robot's appearance or communication skills

but have a stronger impact on robot acceptance than personality. Thus, hindering the level of our internal validity.

External validity

Moreover, external validity is concerned with the issue of whether the results of this research could be generalized outside the context of this study (Bryman, 2012). In our case, due to the choice of our sampling techniques, we are not able to generalize our findings to the broader population. Even though our respondents are indeed yoga practitioners we cannot assume that they are a fair representation of all yoga practitioners in Denmark due to our small sample size. Hence, generalization is not feasible.

4.9 Delimitation

This research work is going to be conducted in Copenhagen, the capital of Denmark in relation to which we choose to include only Danish citizens and people living within the country. This is due to resource constraints as conducting an international study would require more time and access to population samples which we currently do not have. Furthermore, there might be differences when it comes to the culture in-between populations which could influence our results, and which could necessitate more in-depth analysis of numerous important variables over a longer period of time. For example, the robot gave instructions using a female voice and a female name Racheal which could impact the attitude towards Alpha 1 pro from the very beginning. Albeit, the current state of research finding is incomplete and complicated it appears that when robots are gendered by voice and name manipulations a notable influence over behaviours and humans' feelings towards robot agents emerge (Nomura, 2017). Moreover, culture has been demonstrated to affect gender stereotypes. It has been previously revealed that cultural differences in relation to roles and tasks that a given robot would perform exist. For instance, Nomura and Kinoshita (2015) concluded that Japanese people would strongly prefer robots with feminine features to perform the role of a guide (typically in Japan tour guide jobs are taken by women) as compared to robots with masculine features. Thus, cultural viewpoints and differences in perspectives on gender roles have to be well-thought-out when developing robotic applications in specific areas. In regard to Denmark on the other hand, it could be assumed that the gender of the robot will not play as significant a role as it could play for some other cultures. This is because the Nordics in general and Denmark in particular have had a leading position when it comes to gender equality both economically and socially (OECD, 2018) which has been achieved by the destruction of a lot of gender stereotypes, norms, and beliefs. The dimension of gender is only one example of how culture

could affect our results, hence our decision to limit ourselves only to study subjects only living in the country of Denmark.

4.10 Limitations

Additionally, the research design for this paper had to be altered due to the unforeseen COVID-19 pandemic and the consequent quarantine period imposed by the authorities in Denmark. Initially, we had made an agreement with one of the major yoga studios in Copenhagen called "Natha Yogacenter Danmarks største Yogaskole" to combine our efforts in order to conduct the research. The basic idea was to conduct a real-life experiment during which yoga teachers in the above-mentioned studio would have integrated the robot Alpha 1 pro (which was referred to as Racheal in our research) into their sessions by employing it as a co-teacher. This would have been done by organizing a special event (free of charge for the participants) where the yoga practitioners would have been surprised by the robot teacher concept. However, the current circumstances changed our approach greatly as we had to switch to the concept of online yoga class instructed by Rachel. This could have had a substantial impact on the human-robot-interaction and participant's perception of Racheal. It has been previously demonstrated that physically present robots in a users' environment are perceived to be more persuasive and are being evaluated more positively than in the cases when the same robots are digitally displayed on a screen or as virtual character analog (Li, 2015).

The yoga practitioners in this experiment would have been rewarded for their participation in the research in the form of free yoga lessons as the event was planned to be free of charge. We believe that this would have incentivized the study subjects to be more actively engaged and we would have respectively collected more responses and more data. Instead, due to financial restrictions, we could not have offered monetary rewards to the participants in the online version of the experiment which respectively restricted the number of responses we managed to collect.

Moreover, our initial idea would have enabled us to implement a mixed research design by utilizing both quantitative and qualitative data. It might have been beneficial to support our quantitative findings with qualitative data from the interview where we could have painted a more thorough picture of the factors determining the acceptance of edutainment robots such as Alpha 1 pro.

5. Results

5.1 General findings

The aim of this study is to investigate the impact of personality traits on the technology acceptance of edutainment robots within the context of yoga practice. Therefore, this section will illustrate the results from the data that was collected through the online questionnaire. First, we will start with description of our data, followed up by a presentation of the results of our hypotheses.

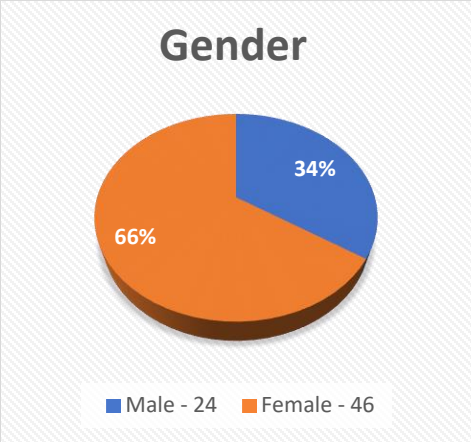


Figure 4 Gender source: own

We will start by showcasing a few of the findings of our study in terms of gender, age, and education. Measures of frequency will be applied in order to create a general picture of the respondent's nature. As indicated in the chart below our sample size consists of 46 females and 24 males, representing 65.7% and 34.3% of the sample size respectively.

The age of our respondents varies with the biggest cluster represented by people aged between 25 and 34 which is nearly half of the yoga practitioners who took part in this experiment – 48.6%. The responses in the rest of the age groups are distributed quite similarly (18-24 – 17,1%; 35-44 17,1%; and 45-54 – 14,3%) with exception of the 55-64 cluster where we have just 2 representatives, forming 2,9% of the total.

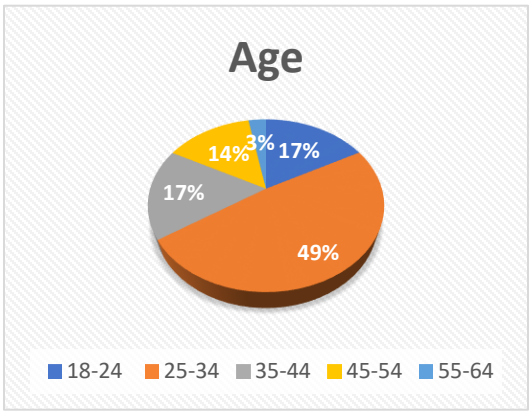


Figure 5 Age source: own

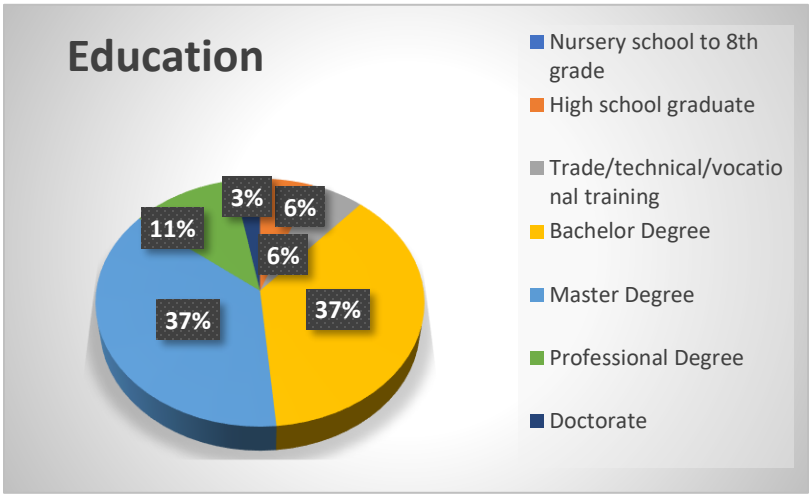


Figure 6 Education source: own

In terms of education, all of our respondents have a degree of education equivalent to or higher than High school degree. The most significant representatives in this variable are people with higher education. Results indicate that the Bachelor and Master degrees are the most acquired types of educations amongst the examined yoga practitioners, forming 74,2% of all participants.

Next, we will take into account the measures of central tendency in regards to the results related to the Big Five personality traits. These measures are concerned with the idea that one value could represent a summary of all measurements, thus indicating the distribution of values. These measures include *mean*, *mode*, and *median* (Bryman, 2012). Mean simply refers to the mathematical average value of a data set. It's an indicator around which the whole data is spread out. The mode is "is the value that occurs most frequently in a distribution" (Bryman, 2012, p.339). Additionally, the median is a representative of the middle point of all values in your data (Bryman, 2012).

Moreover, measures of dispersion will also be taken into consideration. Such measures are the standard deviation, variance, and range. Standard deviation is the measurement that indicates how spread out are the partaker's answers in comparison to the mean. Variance and range are two additional measurements of dispersion. Range is the difference between the lowest and highest value provided in the answers whereas variance refers to spread between the values in the data set (Bryman, 2012).

5.1.2 Agreeableness

As we can see in this graph, the average result of all 70 answers is 3,61 thus mostly revolving around the answer "neither inaccurate nor accurate". According to the official website containing the International personality item pool, in order to interpret the scores of each trait the researcher should calculate the mean and standard deviation. Afterwards, the scores are interpreted as "average" within one-half standard deviation of the mean. Consequently, values lower than the average will be marked as "low" (in a given trait) and "high". Moreover, the website suggests that if our data has normal distribution of scores, the estimated results will show that around 38% of the respondents will score average and around 31% will be respondents in the high and low end (IPIP, n.d.). Hence, we will be looking for certain differences in our findings.

Table 1. Agreeableness

N Valid	70
Missing	0
Mean	3,6171
Median	3,8000
Mode	4,20
Std. Deviation	,78297
Variance	,613

In this case, the average score for Agreeableness will be ranging from 3,22 to 4 according to the mean value and the standard deviation. Therefore, taking into account that the most frequent score has a value of 4,20, we can classify most of our respondents to be high in agreeableness. Moreover, this is supported by the frequency distribution of answers which shows that nearly 50% of the yoga practitioners tend to be high in agreeableness (see Table 1).

5.1.2 Conscientiousness

In terms of conscientiousness, we can see that the average score of our respondents is 3,71 and the standard deviation is 0,84, making the average range to be from 3,29 to 4,13. With a mode of 3,75, we can assume that most of our respondents tend to have an average score on the Conscientiousness dimension. We can confirm those assumptions by referring to the frequency table.

Table 2. Conscientiousness

N Valid	70
Missing	0
Mean	3,7143
Median	3,7500
Mode	3,75
Std. Deviation	,84086
Variance	,707

5.1.3 Openness to experience

In the case of openness, the average range is from 3,42 to 4,26. Here, with a mode of 3,60, we could state that the most achieved score of the respondents lays in the average range, thus assuming that most of the people in our sample size score also average on Openness. Even though, according to the frequency measure this is true, we have to note that the score distribution according to the 3 ranges is as follows: Low – 22.9% of respondents, average – 42,8% high – 34,3% which indicates that there is also a significant size of people who tend to be open to experiences.

Table 3. Openness to experience

N Valid	70
Missing	0
Mean	3,8457
Median	4,0000
Mode	3,60
Std. Deviation	,84247
Variance	,710

5.1.4 Neuroticism

A slight difference in results could be observed for the trait of Neuroticism. The average range here is from 2,85 to 3,84. In this case, we have multiple values for the mode – 3,29; 3,71; 3,86; 4,14 and 4,43. Each of these values has been scored 6 times, however, the frequency of values provided indicates that 40% of the respondents are distinguished as high in neuroticism, 22,9% as low, and 37,1% as average. Also, the standard deviation is higher in this case, thus we can indicate that there was a bigger variability in the scores.

Table 4. Neuroticism

N Valid	70
Missing	0
Mean	3,3551
Median	3,5714
Mode	multiple
Std. Deviation	,99533
Variance	,991

5.1.5 Extroversion

In the case of Extroversion, our results show that we have the lowest mean amongst all traits – 3,29. This makes the average range from 2,87 to 3,71. In this case, we could also conclude that most of our respondents are extroverts as the people who scored high in this dimension represent 42,9% of the sample size as it is also suggested from the mode. In comparison, 37,1% scored low here and could be seen as introverts and 20% were in the average range.

Table 5. Extroversion

N Valid	70
Missing	0
Mean	3,2914
Median	3,6000
Mode	3,80
Std. Deviation	,85104
Variance	,724

Furthermore, we will investigate if there is a relationship between perceived usefulness or perceived ease of use and age, gender, and education.

First, we will begin by examining the accrued responses of men and women towards both PU and PEOU. In terms of gender, we have 2 identified groups – male and female. With regards to perceived ease of use, it could be seen that both genders perceive the robot in an almost equal way and there is no significant difference (p=,188 > 0,05) in their answers (3,42 amongst females in comparison to 3,69 to males). On the other hand, a significant difference was found in relation to PU (p=,001<0,05), hence Alpha 1 Pro is perceived to be way more useful by men (3.5) than women (2,66) (see table 6 and 7). Tables including Independent Sample test results are included in the Appendix.

In general, we could conclude that women tend to perceive the robot as moderately useful where men perceive it somewhat useful. In terms of ease of use, both genders tend to believe that the robot is somewhat easy to use.

Table 6 Gender statistics

What is your gender?		N	Mean	Std. Deviation	Std. Error Mean
PU	Female	46	2.6667	.94803	.13978
	Male	24	3.5000	.82825	.16906
PEOU	Female	46	3.4203	.80257	.11833
	Male	24	3.6944	.85078	.17367

In terms of age, we can identify that most of the yoga practitioners are on the same opinion. All of the groups except the 55-64 segment believe that the robot might have some useful characteristics. In comparison, the 55-64 segments' opinion tends to be negative towards the usefulness of the robot. Moreover, in the case of ease of use, there is no significant difference across the different age groups. Results of our ANOVA indicate F=1,678; p(Sig) = ,166 > 0,05 for perceived usefulness and F=,859; p(Sig.) = ,493 > 0,05, thus supporting our previous statement. Tables will be illustrated below to provide further clarification and ANOVA tables will be presented in the Appendix.

Table 7 Age and PU

What is your age?	Mean	N	Std. Deviation
18-24	3.2778	12	.76321
25-24	2.9020	34	1.10563
35-44	2.7222	12	.78924
45-54	3.2667	10	.89993
55-64	1.6667	2	.00000
Total	2.9524	70	.98668

Table 8 Age and PEOU

What is your age?	Mean	N	Std. Deviation
18-24	3.5556	12	.55656
25-24	3.4902	34	.97177
35-44	3.2222	12	.84487
45-54	3.8667	10	.47661
55-64	3.6667	2	.00000
Total	3.5143	70	.82373

We were also interested in finding in there are any relations between education and perceived usefulness/ease of use. In terms of perceived usefulness, we can identify significant differences (F = 9,349; p (Sig.) = 0,000 < 0,05) as shown per our one-way ANOVA results. People with high-school education perceive the robot to be most useful with a score of 4,6 out of 5. The respondents with a professional degree (3.8) could also be classified to have a positive opinion on the usefulness of the robot. As shown on the table, yoga practitioners with a trade or a technical degree as well as a Bachelor or a Master degree are rather indecisive on the matter, followed by Doctorates who tend to be negatively perceived the usefulness of the robot.

In relation to the ease of use, we can note that there is not such a significant difference amongst the education groups. People with technical or vocational training tend to perceive it as most easy to use which could be assumed is due to their education.

Table 9 Education and PEOU

Education	Mean	N	Std. Deviation
High School	4.1667	4	.86225
Trade/Technical	4.3333	4	.00000
Bachelor	3.2564	26	.85535
Masters	3.5128	26	.80681
Professional	3.5000	8	.64242
Doctorate	4.0000	2	.00000
Total	3.5143	70	.82373

Table 10 Education and PU

Education	Mean	N	Std. Deviation
High School	4.6667	4	.38490
Trade/Technical	3.0000	4	.38490
Bachelor	2.4359	26	.87823
Masters	3.0256	26	.84813
Professional	3.8333	8	.30861
Doctorate	1.6667	2	.00000
Total	2.9524	70	.98668

5.2 Hypotheses results

To begin with, we have applied Factor analysis to our data. It is a technique that groups inter-related variables into small clusters, thus creating different factors. It is commonly used to reduce the number of variables that a researcher has to deal with and it is generally applied to multiple-item measures like Likert scale which is also implemented in this research. Moreover, it is sometimes applied in order to identify whether the dimensions of a measure that is expected to exist can be confirmed (Bryman, 2012). In our case we have different variables for each construct that we measure, thus this type of analysis will be incorporated in order to verify the significance of each question towards the specific construct that is measured.

In order to measure the sampling adequacy of our data for examining how suitable our data is for Factor analysis, the Kaiser-Meyer-Olkin Measure (KMO) of Sampling Adequacy and Bartlett's test of Sphericity will be taken into consideration. The KMO test indicates if there is a common variance amongst the variables in the model. The values of KMO range between 1 and 0 and the guidelines for the results of the test are as follows: *marvellous* in the .90s range, *meritorious* in the .80s, *middling* in the .70s, *mediocre* in the .60s, *miserable* in the .50s, and *unacceptable* below .50 (Kaiser, 1974; Kaiser and Rice, 1974). In the present case, we will also apply the KMO for each separate dimension that we measure as we conduct factor analysis within each construct. The results of our KMO tests indicated that all of our variable groups have scores in the 0.80s range with the exception of two dimensions - Openness to experience (0.684) and Conscientiousness (0.691) which are in the high spectrum of the .60 range. Thus, we accept those results to be satisfactory as they all exceed 0.5 or 0.6 and the KMO test ensures that our study may conduct a factor analysis.

Furthermore, Bartlett's test of Sphericity investigates if there are existing correlations between the variables used. It essentially compares the correlation matrix to the identity matrix and examines if there is a possibility for the variables to be reduced due to their inter-correlation. The test assumes that the null hypothesis is that the variables are not correlated (Ofori-Kuragu, Baiden and Badu, 2016). The results of the test should indicate p-value (Sig.) < 0,005 in order to reject the null hypothesis and state that there may be a statistically significant relationship between the variables (Anthony and Rao, 2007; Garcia- Santillán, Wurzinger and Tejada-Peña, 2015). In our case, the test shows p < 0,000 for each variable group which is less than 0,005 hence, we can conclude that there is a fairly strong relationship between our variables and our data is suitable to continue with factor analysis.

Dimensions	The Big Five Personality Scale Factor Items	Factor Loadings	Cronbach Alpha
Perceived Usefulness (PU)	PU1 PU2 PU3	.863 .819 .792	.886
Perceived Ease of Use (PEOU)	PEOU1 PEOU2 PEOU3	.815 .733 .781	.734
Behaviour Intention (BI)	BI1 BI2 BI3	.915 .857 .799	.919
Openness	O1 O2 O3 O4	.844 .736 .804 .749	.812
Conscientiousness	C1 C2 C3 C4	.800 .769 .738 .734	.916
Extraversion	E1 E2 E3 E4 E5	.838 .814 .759 .818 .857	.849
Agreeableness	A1 A2 A3 A4 A5	.827 .780 .764 .764 .758	.856
Neuroticism	N1 N2 N3 N4 N5 N6	.837 .715 .853 .812 .744 .750	.772

Table 11

As a result of the conducted exploratory factor analysis, 26 items out of the 50-item NEO PI-R version of the Big Five markers have been removed due to unsatisfactory factor loading and negative contribution to the validity of the scale, leaving us with a total of 24 questions to construct the five personality dimensions. Furthermore, the constructs of the TAM model namely PU, PEOU, and BI have been all measured on a 3 items scale. In table 11 we present to the reader the results of the factor analysis including the factor loading and Cronbach alpha.

After conducting the exploratory factor analysis, we proceed with carrying out a path analysis using latent variables which will provide us with a structural equation model that tests the relationships within the model. Structural equation modeling (SEM) could be defined as "a family of statistical techniques used for the systematic analysis of multivariate data to measure underlying hypothetical constructs (latent variables) and their interrelationships. It is a framework that allows researchers to translate theory into a testable model." (Violato and Hecker, 2007, p.362). The goal of SEM in our research will be to measure the significance of the causal relationships between the included variables. Table 12 below provides an overview of the estimated results for the proposed hypotheses.

Relationships	β coefficient	p-value	Conclusions
PU → BI	.883	***	H1 confirmed
PEOU → BI	.191	.007 **	H2 confirmed
PEOU → PU	.300	.020 *	H3 confirmed
OPE → PU	.520	***	H4 confirmed
OPE → PEOU	.754	***	H5 confirmed
CON → PU	.088	.435	H6 rejected
CON → PEOU	-.062	.215	H7 rejected
EXT → PU	-.081	.447	H8 rejected
EXT → PEOU	-.052	.613	H9 rejected
AGR → PU	.196	.326	H10 rejected
AGR → PEOU	.487	0.18*	H11 confirmed
NEU → PU	-.557	***	H12 confirmed
NEU → PEOU	-725	.033*	H13 confirmed

Table 12 Results; * p < ,05; ** p < ,01; *** p < ,001

5.2.1 PU effect on BI

Participants in our study who deemed Alpha 1 Pro as more useful also exhibited a higher score on behaviour intention (BI) towards the robot meaning that the data reveals a positive correlation between the two constructs on the TAM model (β=,883, p < 0,001). Hence, our results confirm H1. These results are consistent with prior research (Devaraj et al., 2008; Davis, 1989). For example, when Bainbridge, et.al

2008b investigated the acceptance of online government services it was concluded that PU is the most important determinant and predictor of Behaviour Intention to use.

5.2.2 PEOU effect on BI

Next, our model hypothesizes that if Alpha 1 pro is perceived to be easy in use, meaning that the robot does not require too much of an effort to operate with, the study subjects will achieve a higher score on the dimension of behaviour intention. Our data reveals that this is, in fact, the case as we observed a significantly positive correlation between the two constructs (β=,191; p < ,01). Therefore, we can confirm H2 in the proposed model. Furthermore, those findings are consistent with the results of many other scholars who confirm this relationship in the TAM model. For example, Rosen and Kluemper (2008) find the PEOU has a positive effect on BI in the context of social networking websites.

5.2.3 PEOU effect on PU

The effect of Perceived ease of use on the perception of the usefulness of a given technology has been studied in many different contexts. The conducted data analysis in this paper reveals that PEOU does influence positively the PU of Alpha 1 pro (β=,300, p<0,05) which is consistent with various other research findings. (Teo, 2010; Ataran, and Nami 2011; Terzis, Moridis and Economides, 2012; Nair and Das,2012; Svendsen, et al.2013; Zhang, Zhao, and Tan, 2010). Therefore, our model confirms H3.

5.2.4 Openness to experience

In regard to Openness to experience our results did provide sufficient evidence to justify the conclusion that PU is affected by this personality trait (β= .520, p <,001). Similarly, to this result, we observed a significant positive effect on PEOU caused by higher levels of Openness in people (β=.754, p < ,001). Existent literature does confirm such findings, for instance Devaraj et al. (2008), prove that Openness to new experiences is going to be associated positively with beliefs about the PU of technology. Based on our analysis we can, therefore, confirm both H4 and H5.

5.2.5 Conscientiousness

The personality dimension of Conscientiousness did not exhibit any significant effect on both PU (β=088, p > 0,05). and PEOU (β=-,062, p >,05) resulting in the rejection of H7 and H8. Previous research has also

concluded that conscientiousness does not affect PU, but on the other hand, it affects PEOU positively (Terzis et al., 2012). Hence, H6 and H7 are rejected as an explanatory variable to the proposed model. Nevertheless, examples of significant effect of conscientiousness for technology acceptance can also be found in the existing literature. For instance, Svendsen et al. (2013) has proved empirically that conscientiousness affects positively BI towards specific software technology.

5.2.6 Extroversion

Our results show that the dimension of extroversion did not have a significant effect on Perceived Usefulness (PU) (β=-.081; p >,05). This conclusion is also valid for the effect of extroversion on Perceived Ease of Use (PEOU) as no significant values (β= -.052; p >,05), meaning no negative or positive effect, were revealed by our analysis. Thus, we must reject H8 and H9. Such results are in agreement with the findings of Bouwman, Kommers, and Deursen, (2014) who have investigated the effect of extraversion on PU, PEOU, Perceived Enjoyment, and Behaviour in relation to the technology of location-based social network (LBSN) information system. In a comparable study, however that utilizes the big five personality markers to investigate the acceptance of software designed to store music, images, and files the researchers have concluded that the personality trait of extroversion does, in fact, correlate significantly with PU, PEOU and respectively with BI. (Svendsen et al., 2013).

5.2.7 Agreeableness

The personality construct of Agreeableness has revealed rather interesting results. The estimations show that Agreeableness has a notable positive effect in relation to PEOU (β=.487; p < ,05). However, no significant effect has been observed when it comes to PU (β=.196; p > ,05). Thus, we can accept the H11 and reject H10. Additionally, our findings are consistent with Terzis et al. (2012) research which was conducted in the context of Computer Based Assessment information systems regarding agreeableness and its positive influence on PEOU. The same research, however, concludes that agreeableness has a negative effect on PU as opposed to our findings that demonstrate no significant effect. On the other hand, a study conducted by Devaraj et al. (2008) has found only partial statistical evidence that agreeableness exerts a positive direct effect on PU. This variety of results within academia indicates that the results may change depending on the particular context.

5.2.8 Neuroticism

The structural equation modeling results regarding the dimension of neuroticism have been conclusive. We observe a significant negative effect on PU (β=-.557; p < ,001) and PEOU (β=-725; p <,05) due to neuroticism. When subjects exhibited a high level of neuroticism this respectively led to decreased perception about the usefulness and ease of use of Alpha 1 pro. Therefore, our results confirm both H12 and H1. These results are in agreement with prior research. For example, Punnoose (2012) conducted a study that had a goal of determining the predominant factors that shape the intention of students to switch to eLearning in the foreseeable future. The results demonstrated that lower levels of Neuroticism inevitably lead to a positive direct effect on PU.

Therefore, we extract the following nested model from the proposed model above which is illustrated in figure 8 below.

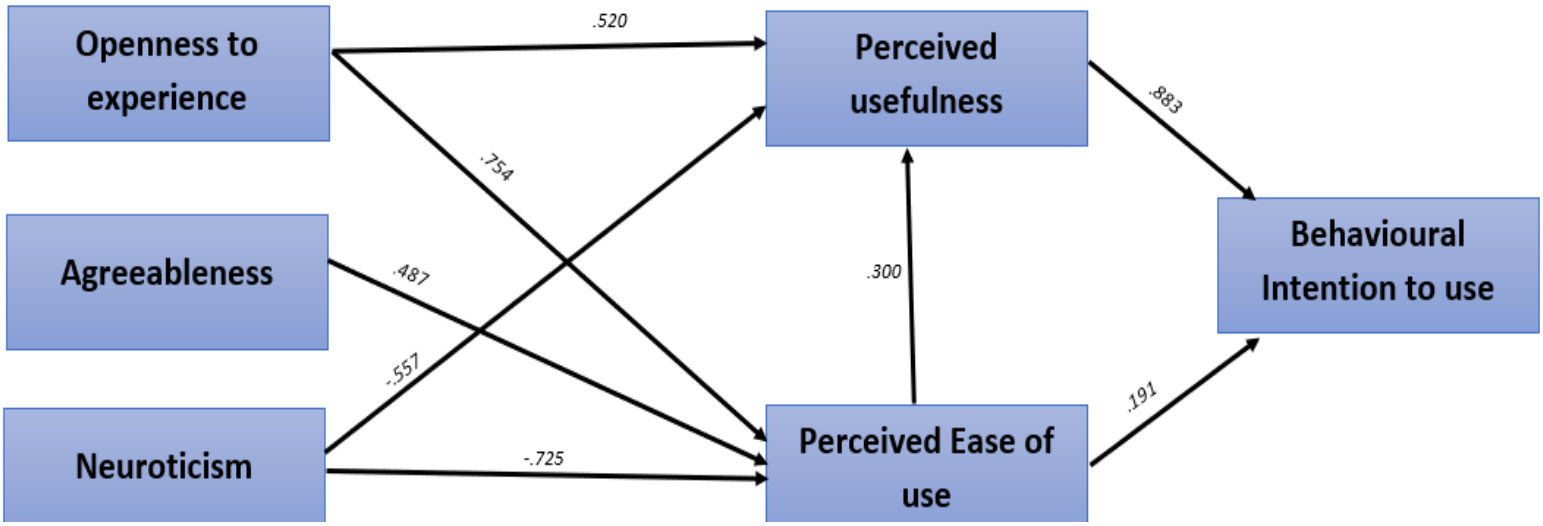


Figure 8 Nested Model; source: own

6. Discussion

The variables of age, gender, and education were included in order to see if there were significant differences between the different groups in relation to the perceived usefulness and ease of use.

In terms of gender, we found no significant difference in the results regarding perceived ease of use as both females and males indicated almost the same results on our questionnaire. In our experiment, we have not measured the perceived ease of use in regard to how easy it is to set up the robot or code actions into it due to the limitations of this online study. Therefore, perceived ease of use here was measured in regard to the ease of following the movement of the robot, learning new postures, and the level of comprehensibility towards the whole Yoga class. Thus, the equality of responses amongst genders could be based on the fact that both males and females perceive the difficulty level of following the postures and instructions to be rather on the same level as they have only seen the robot through a short video. These results differ from other studies that suggest females perceived ease of use more negatively than men due to having higher levels of anxiety towards the new technology (Venkatesh and Morris, 2000). Nevertheless, no such results were indicated in our research.

On the other hand, when inquired about how they perceived the usefulness of the robot, differences occur in-between the gender groups. There is a significant difference (0,9 mean value, p (Sig) < 0,005) when looking into the results. Men tend to perceive the robot to be more useful than women. This is in-line with other studies where males have expressed a higher association towards perceived usefulness than women in the context of e-Learning as our Yoga class could also be categorized as part of this. A survey by Ong and Lai (2006) examined the opinions of 67 females and 89 males on the use of e-learning tools and their results suggested that females assign more importance to the perceived ease of use dimension due to higher computer illiteracy (inability to complete tasks on a computer without assistance). In comparison, men tend to perceive usefulness as more important for the adoption of new technology. In another study, acceptance of Virtual Learning Environment was measured amongst 200 undergraduate students and results indicated that females put more attention to the perceived ease of use as they found it more complicated to operate with than men which ultimately had a higher effect on the intention to use than the usefulness of the system (Milis, Wessa, Poelmans, Doom and Bloemen, 2008). Similar findings are also identified in other studies (Islam, 2011; Liaw and Huang, 2011).

Moreover, these results could be based on certain understandings such as that the males are perceived to be more task-oriented and tend to be motivated by the desire to accomplish certain goals. Thus, this has a direct effect on how they perceive the usefulness of technology in comparison to females. In comparison, it is considered that it is harder for women to realize the advantages of that technology since they are believed to have a lower level of computer self-efficacy (Flandorfer, 2012).

Examining the age groups reviews no significant differences between perceived ease of use or usefulness and age. Five age groups are included with a range from 18 to 64. Concerning perceived usefulness, the only age group that has expressed a negative opinion towards the usefulness of the robot is the 55-64 group, thus having also a negative effect on their intention to adopt the robot. This could be due to past experiences or personal preferences towards human to human interaction. Nevertheless, only 2 respondents are included in this age group, therefore no decisive conclusions could be made in relation to them. Moreover, there is no noteworthy difference across age groups in terms of the ease of use of Alpha 1 Pro. Respondents from all ages perceive the robot to be rather easy to use for completing a short Yoga class. These findings yield similar results as the study by Ezer, Fisk and Rogers (2009) who found no significant relation between age and perceived ease of use or usefulness when examining the acceptance of domestic robots. Acceptance of robots was also studied by other researchers and similarly no significance was found in relation to age (Bröhl, Brandl, Nelles and Mertens, 2016). On the other hand, interestingly our results also support Heerink (2011) who found that age correlates with Intention to Use where older adults tend to be less inclined to adopt new technologies than younger ones.

In connection with perceived ease of use and education, we can note that high schoolers and Doctorates, as well as people with technical or vocational training, perceive the robot as fairly easy to use. The other education groups – Masters, Bachelors, and people with professional degrees have a rather positive opinion on the ease of use of the robot. Therefore, we conclude that there is no significant difference between those groups which was also supported by the ANOVA ($F= 2,096$ and $p > ,05$ level).

In contrast, the results of this paper indicate that the level of education has an effect on the perceived usefulness of the robot ($F=9,349$; $p=0,000<,05$ range). People with high school as well as professional education tend to have a positive opinion on the usefulness of the robot, followed by individuals with bachelor and master degrees or either technical or vocational education who are rather indecisive on the matter. The last group of respondents that includes the ones with Doctorate degrees can be associated with negative opinions on the usefulness of the robot and therefore on its acceptance to use.

In relation to that, Heerink (2011) suggests that education is related to the perceived sociability of the robot which has an effect on the attitude towards usage. He proposes that users with a higher level of education will perceive the robot to be less of a social agent. Hence, adopting a negative behaviour towards the use of the robot. These findings could be associated with the results of our study as in our case perceived usefulness had a significantly greater influence on behavioural intention than perceived ease of use.

Moreover, Abu-Shanab (2011) examines the moderating effect of education between performance expectancy, self-efficacy, perceived trust, locus of control and behavioural intention in the context of online banking. His findings suggest that individuals with higher education tend to believe that they have more control over their environment and skills as they are not inclined to accept luck as a moderator of their performance. Thus, it is expected that they will have a higher intention to use Internet banking. Nevertheless, the context of the study is quite different from the implementation of an edutainment robot into the Yoga service.

As it was mentioned previously our first set of hypotheses aimed to investigate whether the individual personality traits of a person affect his/her attitude towards technology and respectively the acceptance or rejection of it. In particular, we focused on personality traits as a predictor of the acceptance of edutainment service robots which is a continuously growing market worldwide. Those kinds of robots are beginning to receive more and more crucial roles in various industries for a lot of different end-use- applications. The industry of entertainment robots has experienced significant progress in the development of multimedia robots, robotic toys, and personal (domestic) edutainment service robots. It is furthermore projected that the sales of personal/domestic robots could potentially exceed 55 million units with an estimated value of 9,8 billion dollars in 2022 (Mueller, 2019). The robotic toy market alone is expected to increase its market value to 1,7 billion dollars in 2022 as a result of a 10% annual expansion (Mueller, 2019). The market for handicap and elderly assistance, on the other hand, is projected to increase by an average of 29% annually generating a total of 126 million in 2022 due to technological advances in robotic mobility, vision technologies, etc. (Mueller, 2019).

The media and popular culture have been captivated by the idea of robots since the invention of the first computer. Despite being a relatively new commercially available field, many different types of robots have been developed out of which a significant number is already in use for various service applications. In the foreseeable future, the development and technological progress within the field of robotics will most likely lead to significant societal changes affecting nearly all domains of life including the nature of service delivery. It is not going to be farfetched to imagine a society in which a lot of the menial human jobs of today are replaced by robots, for example, occupations such as delivery man and restaurant greeter are already being aided or taken completely over. Robots are projected to enter and change many different industries such as hospitality, health care, customer service, elderly care, house & home, transportation, finance, etc. This increasing robotization will not only have profound effects on the workplace but will logically increase the density of social interactions between humans and robots. Humans will find themselves to be more and more often in the position of having to interact and work with artificial

intelligence than with other people. However, even though robots have the potential to exceed human capabilities in virtually all aspects and despite their high level of efficiency that humans can take advantage of when trying to complete their goals, it is still not certain that robots will be universally accepted by all. People are probably not going to reduce their choice of working/cooperating with a robot solely to functionality and efficiency considerations. Instead, the issue could prove to be much more complicated. Therefore, it will become paramount for robot developers and businesses that sell or utilize robots in order to provide services to improve their understanding of what makes the interaction between humans and robots successful.

The topic of personality and its effect on interpersonal social relationships in human to human interactions has been previously investigated by academia. For example, Asendorpf and Wilpers (1998, p.1531) have conducted a longitudinal study that demonstrates conclusive results regarding the interplay between personality and social relationships. Their study proves empirically that some of the Big five factors of personality namely: Extroversion (its subfactors of sociability and shyness), Agreeableness, and Conscientiousness have a predictive power regarding social relationships such as peer relationships, conflict with peers and falling in love. They manage to demonstrate that the quality of a human to human interaction is contingent upon the particular individual and collective mix of personality traits exhibited by the involved parties. Moreover, there are different social studies that examine the relationships between daily social interactions and the Big five-factor model of personality. One such study was conducted cross-culturally in Germany and the United States of America (Nezlek, Schütz, Schröder-Abé, & Smith, 2011). The study itself concluded that in the United States the personality traits of Openness and Extroversion were positively related to reactions to interactions. This means that people will react in a more positive way towards a particular interaction with another person if this other persons' personality is characterized by Openness and Extraversion. On the contrary, these traits were not related to reactions to interactions in the country of Germany. Furthermore, in the US Extroversion was positively related to how socially active the study subjects were, whereas in the German context none of the Big Five Personality traits correlated with the volume of social interactions a person has. Nevertheless, in both cases, Extroversion affected the percent of interactions involving friends and peers (Nezlek et al., 2011). In summary of their findings, Americans who were high in Openness were more successful in social interactions, while in the German context this quality was less desirable in relation to social interactions.

From this short overview of the topic, we get an idea of how important personality traits can be for the success of social interactions when it comes to human to human relationships. But of course, since this paper investigates personality and its influence of robot acceptance in the context of Human-Robot

Interactions the reader can ask himself/herself how does this relate to the dynamics of human and robot interactions. Of course, such a question would be justified and demands explanation.

Interestingly, humans tend to act towards certain technologies and inanimate objects as if they are interacting with other people. Because we are social beings used to interacting with other social beings, we tend to ascribe personality and personality traits where there are none. If personality is a significant variable when it comes to human interactions, it must be relevant at least to some extent for the success of human-robot interactions as well. Especially, if we are focusing on humanoid service robots that are already designed to resemble humans with distinct anthropomorphic features and are programmed to simulate social interactions with humans. Scholars have already investigated the question of how people interact with one type of interactive technology namely: computers. For example, Reeves and Nass (1996) have demonstrated experimentally that people tend to treat computers in the same fashion they would treat other people regardless of whether we are considering computer novices, experts, or critics. The participants treated computers with a level of politeness that is usually reserved for other fellow people. They were reluctant to criticize the computer as they wanted to avoid offending or hurting the computer “feelings". On the other hand, participants felt good when the computer was complimenting them. In team competitions, the study subjects were even willing to side with a computer to defeat another human if the human was part of an opposing team. More interestingly it appears that such personification of technology happens subconsciously contrary to people’s conscious beliefs. We sometimes ascribe human characteristics to objects without even realizing it. For instance, when study participants were asked beforehand if they could ever imagine a scenario under which they would be treating a computer as a real person they all dismiss and deny such a prospect (Reeves and Nass,1996). The denial continued even after the end of the experiment as participants were insistent upon the position of them treating the computer simply as a machine which was contradicted by the results (Reeves and Nass,1996). Similar results were observed by another research that considered children’s perception of robots with respect to emotional traits and personality (Woods, Dautenhahn and Schulz 2004). The research concluded that children assign personality attributes to robots with the effect being stronger for humanoid robots with human gender features.

But why do people tend to ascribe human characteristics to inanimate objects and why do we act as if those objects possess personhood. According to Reeves and Nass (1996), the correct explanation comes from an evolutionary point of view. They state that “the human brain evolved in a world in which only humans exhibited rich social behaviour, and a world in which all perceived objects were real physical objects. Anything that seemed to be a real person or place was real." (Reeves & Nass, 1996, p.12).

Evolutionary processes have built our brains with innate mechanisms that allow us to act socially with others that also act in a social manner with us. In essence, we are beings that have become experts in the field of social interactions through evolution. However, because evolution is a relatively slow process our brains have not had the time to change much for the last couple of thousands of years, yet the same brains have to deal and operate with the technology of the 21st century. As a consequence of this if any technology (such as Alpha 1 pro) has social competences and behavior we tend to put into practice our evolved social mechanisms to respectively interact in a social manner with it. In fact, Reeves and Nass (1996) reasoned that it takes extra effort for people to consciously prevent themselves from following the desire to act socially with machines.

In summary, because of the fact that personality plays an important role as a determinant for the success of human relationships/interactions and because we tend to assign a personality to technology (especially technology which is built to simulate social interactions and resemble human-like features) we can infer that personality traits of people will be a significant factor when it comes to the acceptance of robot technology. Next, we proceed by discussing the results from the set of hypotheses regarding the Big Five Personality traits and their relation to the Technology Acceptance Model (TAM)

6.1 Extroversion

As it was briefly presented in the results section there are contradictory results when it comes to the dimension of extroversion and its effect on PU and PEOU by prior research. Some researchers find strong correlations between the constructs of extroversion and Technology Acceptance while others do not observe any significant positive or negative correlations (Devaraj et al., 2008). In our case, we have hypothesized that Extroversion will affect positively both PU and PEOU which was later rejected. We expected to observe positive relationships in cases where people exhibited high levels of extroversion in relation to PU and PEOU because of the fact that extroverts are outgoing, prefer to work in teams, enjoy spending time with others, etc. Since extroverts have the tendency to seek social stimulation (Power and Pluess, 2015) and to conduct social relationships with others we suspected that such individuals will be more likely to accept the Alpha 1 Pro as a partner in their yoga practice and respectively they will be more likely to form a relationship with such technology. This premise is deduced from what we discussed above in relation to people's tendency to personify objects that simulate social competences or resemblance to real social actors in the same way Alpha 1 Pro attempts to do. Moreover, because extroverts prefer to work in teams and

among other people as opposed to introverts which generally favor working and being alone, it was expected that Alpha 1 Pro would be perceived as an entertaining and adventurous social partner that enhances the experience of yoga practice.

However, an argument could also be made that the technology we utilized for this research cannot be associated with social activities, thus being not particularly appealing to socially inclined personalities. After all, Alpha 1 Pro is meant to be an edutainment robot for the home which does not fit with the established paradigm of practicing yoga in a group with other people. Previous research, for example, has concluded that extroversion has a significant positive effect on PU and PEOU (Svendsen et al., 2013) for the acceptance of software technology which is designed to store digital belongings such as music and pictures, books, data files, etc. More importantly, this software allowed users to share their files with other users by giving them a key to the "vault". The authors speculate that extroversion had a high impact on PU and PEOU in their specific case because of the nature of the technology which allows users to engage in social interactions and logically is more appealing to extroverts.

Additionally, we could argue for our results based on the fact that extroversion is related to low emotional arousal which may motivate an individual to seek other external motivations such as interactions with others. Thus, having in mind that the video lesson was supposed to be watched and done individually by each of the respondents we believe that it might have had an effect on the opinion of more extroverted people on perceived usefulness and ease of use.

If we were to conduct our initial ideas for experiment design in a yoga school where the robot would have been a co-teacher among many other yoga users then we might have reached different conclusions regarding the dimension of extroversion. Participants might have perceived the robot as more socially engaging and as interesting new technology that changes the group dynamics. It is possible that under that condition yoga practitioners would have accepted the robot (at least subconsciously) as a new member of the group and as a tool to make the social environment more robust and entertaining,

There is a high probability that the pattern of influence from extroversion to technology acceptance will vary based on the nature of technology or service in question. Extroversion can be very important in one particular context and irrelevant in another. Taking that into consideration, the reader should not take the results that this study has produced as evidence in support of the general importance of extroversion in technology acceptance. The results should rather be seen as a piece of evidence for the importance of extroversion in our particular case.

Finally, prior research managed to mediate the effect of extroversion on technology acceptance. For example, McElroy, Hendrickson, Townsend and DeMarie (2007) discovered that by controlling for the traits of self-efficacy and computer anxiety the effects of extroversion on Internet use disappear. Our study did not utilize any such control variables. More in-depth research could use such control variables to investigate whether the effects of extroversion on robot acceptance will differ.

6.2 Agreeableness

We have hypothesized that the personality trait of agreeableness will have a positive effect on both PU and PEOU of the edutainment robot Alpha 1 pro. After the analysis of the results, we have observed no significant effect of agreeableness on PU, but we have also observed a significant positive effect of agreeableness on PEOU. The logic behind these hypotheses can be confined to the idea that people high on that trait are described as having a strong inclination towards flexibility, kindness, affection, cooperativeness, and tolerance (Barrick and Mount, 1991).

Moreover, it is suggested by meta-analytical results that the personality dimension of agreeableness carries substantial predictive validity regarding jobs that involve a lot of teamwork and/or interpersonal interactions, which is particularly true in cases where the interaction includes the act of cooperating with and helping other (Barrick, Mount and Judge 2001). Hence, the relationship between technology beliefs and the personality trait of agreeableness will be strongest when the particular technology fosters cooperation, collaboration with others, and task accomplishment. As opposed to individuals that exhibit low levels of agreeableness, people that score high on this dimension are much more likely to show cooperative behavior and accommodating attitude when being asked to take into consideration some new technology. Such individuals are more likely to focus their attention on the cooperative and positive aspects of the technology versus some other less facilitative elements of the performance.

We believe that this could serve as an explanation of the observed positive correlation between Agreeableness and PEOU. In the conducted experiment the participants had to collaborate with Alpha 1 pro in order to complete the 5 minutes class and the yoga moves themselves. The technology itself fosters collaborative behavior which means that people high on agreeableness are more likely to display an accommodating attitude and more importantly enjoy this new human-robot interaction in the context of yoga which they have probably never experienced before. Their perception about the ease of use of Alpha 1 pro could have been affected as the process of working together towards a common goal with someone

else might have made the 5 minutes yoga class easier for people high on agreeableness than people low on it. This could have resulted in the confirmation of H11 in our research.

Furthermore, the dimension of agreeableness is related to intention to use technology when the use of that technology is believed to impact social perception and view on oneself by the others. It has been demonstrated that social influence is a significant factor within the process of technology acceptance (Venkatesh and Morris, 2000). Because of the fact that people are concerned with the issue of how others will evaluate certain behavior, social perception affects people's cognitive reasoning, attitudes, and behaviors. For instance, Venkatesh and Morris (2000) relate the concept of social influence with the concept of "image", which should be understood as the degree to which a particular innovation or technology is believed by the user to enhance his/her social status in one or multiple social systems. Because of the fact that "image" directly reflects the influence of others on us and just how important it is that those others think positively about us, the concept plays a crucial role in forming Behavior Intention towards technology. Essentially, this means that the trait of agreeableness is a representation of one's sensitivity towards the opinions of his/her social circle and society as a whole. Agreeableness relates to people's considerations of how they will look in the eyes of their friends, relatives, and acquaintances (Venkatesh and Morris, 2000). Therefore, we expected that this dimension should moderate the relationship between Perceived Usefulness, Perceived Ease of Use, and Behaviour Intention towards the use of Alpha 1 pro.

This could be one theoretical justification on why we have not observed significant correlations between Agreeableness and PU. We must admit that the concept of robot use in the context of yoga is rather unorthodox and a completely new paradigm in regard to the meaning of yoga. Incorporating such technology in your yoga practice might be perceived as a violation of the traditional approach in yoga teachings. Therefore, people might have had their doubts in relation to how they would be perceived by other people in the yoga community. Moreover, despite the bright future prospects for the development of domestic edutainment robots a lot remains to be done. The robot which we used for our experiment is closer to a toy than a real yoga teacher. The perception of Alpha 1 pro as a mere toy might have led to negative connotations since toys are something we associate with children and respectively with immaturity. This could further intensify the study subjects' considerations regarding the way they could be perceived by others if they were to use such a robot at home or if they were to attend a class in the foreseeable future where the teacher itself would be a robot.

6.3 Neuroticism

Within the context of our research, the personality dimension of Neuroticism has proven to exert a significantly negative effect on both PU and PEOU. Based on our results people low on neuroticism saw Alpha 1 pro as much more useful and much easier to use in comparison to people that scored high on this trait.

Individuals who are low on neuroticism are characterized by emotional stability, calm demeanor, and collected personality. In comparison, individuals who have high levels of neuroticism with an inclination towards paranoia, anxiousness, self-conscientiousness; and negative emotions and reactions (Barrick and Mount, 1991). There is an abundance of research in regards to neuroticism in many different contexts. For example, empirical research concludes that this personality trait is negatively correlated with many important elements of work behavior i.e. job satisfaction, perceived career success, job performance, etc. (Judge, Heller and Mount, 2002; Seibert and Kraimer, 2001; Slaughter and Kausel, 2009). Nevertheless, neuroticism effects are not limited only to the work environment. Instead, this trait leads to negative reactions in life situations as much as it does in the work context. This translates into a negative attitude regarding perceived usefulness and perceived ease of use in general and to the rejection of Alpha 1 pro in particular. Therefore, it was expected that the study subjects high on neuroticism would think of Alpha 1 pro as much less useful and more complicated to use than people low on neuroticism.

If we have to be more specific in regard to our case, we believe that it is reasonable to assume that the results we generated could be attributed to fears towards robots and robotization of society. Logically, such fears should be more prevalent in neurotic individuals. Since the early age of automatization, throughout the industrial revolutions, people were anxious and concerned about the machine's influence on the job market (Massachusetts Institute of Technology, 2019). Today with the advancement in artificial intelligence and robotics people are still worried about the effects on the job market, but they are also equally worried about the effects of artificial intelligence on society and social values. There is a substantial social debate with people on both sides of the coin. Some are promising great gains and improvements on all levels of life while others are of the opinion that we could face disastrous consequences as a result of the exponential technological advances currently in progress. Robots themselves are portrayed very frequently in the media (books, film, newspapers, etc.) as villains and monstrosities irrespective of the intended purpose and application they might have. According to Szollosy (2016, p.433), “Using the psychoanalytic notion of projection, these monsters are understood as representing human anxieties regarding the dehumanizing tendencies of science and reason, and regarding a perceived transformation in human nature over the last

two hundred years." Yoga consists of many different principles with some of the most important ones being self-realization and moral injunctions (Taimini, 1986). If we assume that neurotic people are more likely to experience negative feelings and carry negative opinions towards robots, we could easily explain our results in relation to those two concepts. Self-realization has many different conceptualizations, but according to the Indian understanding it is about achieving liberating knowledge of your true Self as a permanent undying spirit or soul. The primary goal of yoga is supposed to be about the achievement of a holistic lifestyle that should lead its followers to a state of total mental, social, physical, and spiritual well-being. Moreover, yoga practitioners peruse self-realization by achieving complete harmony with nature (Taneja, 2014). However, if technology and robotics, in particular, are perceived by neurotic yoga practitioners as means leading towards societal dehumanization and as something that removes the human spirit further and further away from nature then it is no surprise that participants high on this personality trait rated Alpha 1 pro as not useful. Essentially, machines and robots can be perceived as "cold, rational, efficient, mechanical, soulless and ultimately destructive" (Szollosy 2016, p.437) especially by neurotic individuals that fear the uncertainty that comes along with progress.

However, we can point to a different theoretical justification regarding why neurotic study subjects rated Alpha 1 pro low on PEOU. A possible explanation could be related to the concepts of self-efficacy and robot anxiety. As we already discussed, neurotic individuals are more anxious which could lead to less belief in their own abilities to master new technologies which respectively could explain our results. If those individuals get anxious when operating with new technology, then they can self-convince themselves that Alpha 1 pro must be hard to use. Earlier we have mentioned a study conducted by McElroy et al. (2007) which investigated the effects of personality (Big Five Personality Traits in particular) on Internet usage. The study found out that before controlling for computer anxiety and self-efficacy neuroticism predicted only readiness of people to engage in online selling. After controlling for these two variables the results showed that neuroticism is a predictor of both online selling and buying. No such control variables were utilized for the objective of this study. Nevertheless, it would be relevant for future research to take that approach.

6.4 Conscientiousness

Individuals with strong conscientious personalities take proactive actions to improve their job performance and aim to execute their duties at a high level. Those types of people are self-motivated to achieve and

relentlessly pursue their goals. Furthermore, the building block of the conscientious personality is the ability of self-control. This ability reflects the desire for order, persistence, and achievement (Costa, McCrae and Dye, 1991). According to Barrick and Mount (2000), the intrinsic motivation to work and perform at the highest possible level consists of these personality traits and characteristics which are fundamental to conscientiousness.

Due to the fact that the personality trait of conscientiousness is a reflection of the intrinsic motivation to constantly improve performance, we anticipated that individuals with conscientious personalities are going to be much more likely to consider whether Alpha 1 pro gives them an opportunity to complete their yoga practice more efficiently and improve their performance with the robot's assistance. We also expected that conscientious personalities will act in accordance with their assessment of the robot's contribution to their performance. Specifically, it was expected that the study participants who possess highly conscientious personalities will be more inclined to analyze and consider the different ways in which Alpha 1 pro could be used to increase their performance and level of efficiency. In the case where this cognitive process leads to positive beliefs regarding Alpha 1 pro (meaning that the robot would be perceived as beneficial to the practice of yoga and people's performance), it was expected that the trait of conscientiousness will amplify these beliefs and respectively increase the level of BI. On the contrary, in the case where this process leads to negative beliefs about the robot and its usefulness, it was expected that conscientiousness will amplify those beliefs and respectively decrease the level of BI.

The results of our study did not conclude any significant negative or positive correlation between Conscientiousness, PU, PEOU, and consequently BI. Therefore, we have rejected H6 and H7. These results could be attributed to people's limited knowledge about the robot, its functionalities and overall performance since the structure of the experiment allowed them to only watch the robot perform limited number of yoga poses for 5 minutes. Consequently, conscientious personalities might have not had sufficient information to decide whether or not such technology could be useful to their needs. We argue this to be the case since a negative belief about the robot's usefulness and ability to increase performance should have resulted in a negative correlation between Conscientiousness PU and PEOU. However, our results demonstrate neither negative nor positive relationships. This tells us that it might have been complicated for people to decide conclusively if such a robot can be implemented within the context of yoga based on their limited knowledge. Therefore, conscientious personalities did not dismiss but did not approve the robot as well.

6.5 Openness to new experiences

Individuals who have a high score on the dimension of openness are characterized by curiosity and a large desire to try new things. They are constantly looking for new experiences, hence their positive attitude towards trying different new things (McCrae and Costa, 1997). On the contrary, individuals low on Openness to Experience are not comfortable with change and strongly prefer stability. Therefore, it was expected that participants high on openness in our research would show stronger tendencies of holding a positive attitude towards the acceptance of robotic technology in general and positive attitudes towards PU and PEOU of Alpha 1 pro in particular.

This assumption was made to a large extent because of an individual's predisposition to feel less intimidated by change which is an extremely dynamic process in technology development and his/her tendency to accept and seek out new approaches to work, leisure, etc. The strong craving to try new and diverse things, which is a foundational characteristic of Openness to experiencess, was assumed to influence participants' judgement in relation to the utility and ease of use of Alpha 1 Pro. Additionally, our assumptions are in congruence with Behavior Decision Theory which argues that people are predisposed to look for information that matches their wants and existing beliefs. Simultaneously, as humans, we also have the tendency to dismiss information that contradicts our beliefs and is inconsistent with what we want. This phenomenon is more widely known as confirmatory bias (Slovic, Fischhoff and Lichtenstein, 1977). Thus, it was anticipated that people displaying a higher level of Openness to Experiences will embed the arguments which are consistent with their own preferences to utilize the new technology in Alpha 1 pro with bigger significance. These expectations were justified as the results of our research led to the confirmation of both H4 and H5 as this personality trait had positive effects on PU and PEOU. Our findings are in agreement with prior research on the effect of Openness to Experience on PU and PEOU. For example, Zhou and Lu (2011) have found that openness to experience affects PU and PEOU in relation to the acceptance of mobile commerce. However, academic papers that support different conclusions can be found as well. For instance, when Rosen and Kluemper (2008) investigated the effect of openness to the acceptance of social networking sites their results showed no significant effect on PU. Therefore, our results should not be generalized to fit the acceptance of robots as a whole. Instead, it should be clear that the findings of this research apply to the particular c ontext.

The second set of hypotheses we have built was related to the investigation of the internal relationships in-between the constructs of the Technology Acceptance Model. Extant research has revealed that the variables of TAM namely: PU, PEOU, ATT, and BI are significantly correlated. For example, it is argued that a higher level of PEOU of a particular technology leads to respectively a stronger perception regarding PU of that same technology. Thus, PEOU influences the construct of PU (Davis, 1989). Furthermore, those two variables affect conjointly the construct of BI.

However, some of the studies that utilize the technology acceptance model as a theoretical framework do not attempt to verify the internal relationships in it. Instead, they take for granted the assumptions of the model irrespective of the particular context in which the specific study is being conducted. Nevertheless, it is important to verify those relationships because of the different contexts and more importantly because of cues that can emerge if those relationships are disproven. For example, if we discover that PEOU does not influence the dimension of BI in regard to Alpha 1 pro, we might have to take into consideration some other more important variable that was previously missed and which provides a better theoretical explanation. For instance, it should not be boldly assumed that in every possible context of technology acceptance the PEOU will be significantly important enough to people. Instead, there might be more important variables that determine people's desire to use a specific technology.

For example, a study conducted by Yih & Nah (2009) aimed to identify whether the two determinants of the technology acceptance model (PEOU and PU) affect the behavior intention of students towards the use of weblogs which were used in classrooms by educators to teach new languages. In that case, it was concluded that the constructs of PU, PEOU, and BI were positively correlated at a significant level. These results are also true for a study that investigated the relationships between the determinants of the TAM model in the context of mobile-based agricultural extension services (Verma and Sinha, 2018). However, other studies' findings are in disagreement with such conclusions regarding a positive relation in-between the TAM constructs. For example, the study of Letchumanan and Muniandy (2013) finds out that even though PEOU has a positive correlation to PU, PU is not a significant determinant to BI. Additionally, a study concerned with the acceptance of web-based subscription databases concluded that while there is a significant positive effect caused by PEOU on BI, at the same time there is no significant relationship between the constructs of PEOU and PU (Kim, 2005).

Moreover, some researches find theoretical justifications to include other variables that could better determine behavior intention towards the use of the particular technology they investigate. For instance,

when Zhou and Lu (2011) examined the user acceptance of mobile commerce technology they decided to remove the construct of PEOU and instead substitute it with the construct of *trust* which was believed to play a much more significant role due to the hazards of online shopping. In fact, this assumption was confirmed.

In accordance with the argument presented above, we have therefore deemed essential to examine the inner relationships in the TAM model. Next, we proceed by discussing our results in relation to those inner relationships.

6.6 Perceived Ease of Use in relation to Perceived Usefulness

Inconsistency with the hypothesized expectations, our results prove a positive correlation between PEOU and PU. As we briefly exemplified earlier those results are in agreement with the findings of many similar studies. These results seem logically justifiable when we consider that the study participants were not from robotics, IT, or any other relevant field and had no prior knowledge in relation to the use of Alpha 1 pro. The study subjects were self-selected at random which makes it possible that someone or some portion of the participant's pool had prior knowledge and/or expertise in the field of robotics; it is also possible that some of the study subjects knew of this particular robot and even used it before. However, due to the fact that those participants were self-selected on a random principle, we believe that it is safe to assume that most of them did not, in fact, have such prior knowledge. The design of our study did not discriminate against the participation of anyone as we did not specifically seek out people from the field of robotics or people with prior knowledge of Alpha 1 pro and similar technology. Therefore, it comes as no surprise that people without such background would only prefer to incorporate Alpha 1 pro in their yoga sessions if they believe that this robot would not hinder their practice by being difficult to use. Hence, the construct of PEOU should be considered a significant determinant that makes the edutainment robot Alpha 1 pro perceived as useful.

6.7 Perceived Ease of Use relation to Behaviour Intention to Use

It is furthermore revealed by our findings that PEOU affects positively the behavior intention towards the use of Alpha 1 pro. We infer that if a person perceives the robot as easy to use, he or she will develop a

positive intention in relation to the actual use of it. Thus, PEOU is an important determinant to the intention of people to use such edutainment (domestic) robots like Alpha 1 pro. As we mentioned earlier in the paper, we have collected information about the perceived ease of use of Alpha 1 pro by asking the participants questions regarding the comprehensibility, ease of following the movement, and ease of learning new moves with the help of the robot. Previously, we discussed that this decision was taken in response to the unexpected situation with the virus COVID-19 forcing us to make necessary alterations in the initial study and data collection design. Nevertheless, it should be noted that if the study subjects had the opportunity to operate and play physically with the robot then they would have had much better comprehension regarding the required efforts in the process of operating with Alpha 1 pro. Respectively, we could have collected more thorough information to explain fully the construct of PEOU. We realize that this might have had a different impact on our results and specifically on BI. Despite this, we believe that the designed PEOU questions manage to encompass and important aspects regarding the ease of use of Alpha 1 pro particularly in the context of yoga practice.

The lower significance of PEOU towards BI could also be explained by the fact that according to Davis (1989) PEOU could have an indirect effect on BI through PU. This situation could also be seen in our research as PEOU has a stronger direct effect on PU than BI. Furthermore, as shown in our results PU has a strong direct relation to BI, thus allowing for this indirect effect to be feasible.

6.8 Perceived Usefulness relation to Behaviour Intention to Use

Inconsistency with our expectations, PU proved to be an important determinant of the construct of BI. These findings are supported by prior studies that reveal the significant importance of PU to BI in the contexts of web-based and mobile learning technology that supplement college classroom studies (Stoel and Lee, 2003; Chang, Yan and Tseng, 2012). Even though the effect of PU was significant to the construct of BI, it was still weaker than the effect of PEOU on the same construct in comparison. Such a result provides credibility to the findings of Davis et al., (1989) study in which it is argued that the dimension of perceived usefulness is, in essence, a performance measure that requires time and more importantly actual use for decisive evaluation to be formed. Since we assume that the majority of the participants in this study did not have significant experience with robots of the kind in general and experience with Alpha 1 pro in particular, the results of perceived usefulness on behavior intention find their logical justification. If the participants were given the opportunity to play with the robot for a while, experience it in a real environment, get familiarized

with its functionalities, get to know how to program moves in the robot, get to know the app and software program that accompany Alpha 1 pro then they would have had a more complete overview and opinion in regards to its utility. In that case, we would have expected our results to indicate a stronger correlation between PU and BI.

7. Theoretical implication

This research study demonstrates the effect of human personality on the acceptance of edutainment (domestic robots). We explain and identify personality factors that influence yoga practitioners' perception and behaviour intention to use a technology that is gaining more and more popularity both in societal and business environments. Furthermore, our study has confirmed the presence of a significant positive relationship in-between the following constructs as it was hypothesized earlier.

- Agreeableness has a positive effect on Perceived Ease of Use (PEOU)
- Neuroticism has a negative effect on Perceived Usefulness (PU)
- Neuroticism has a negative effect on Perceived Ease of Use (PEOU)
- Openness has a positive effect on Perceived Usefulness (PU)
- Oppress has a positive effect on Perceived Ease of Use (PEOU)
- Perceived Ease of Use (PEOU) affects positively Perceived Usefulness (PU)
- Perceived Ease of Use (PEOU) affects positively Behavior intention (BI)
- Perceived Usefulness (PU) affects positively Behavior Intention (BI)

We have confirmed the importance of those personality traits and their influence in relation to the adoption of robotic technology in the context of yoga practicing. Thus, future research should take into consideration the positive impact of personality traits when investigating the acceptance of similar service robots by consumers. Nevertheless, it should also be taken into consideration that as opposed to many other research studies, no significantly positive relationships were discovered in-between the following constricts.

- Agreeableness did not have a significant effect on Perceived Usefulness (PU)
- Extroversion did not have a significant effect on Perceived Usefulness (PU)
- Extroversion did not have a significant effect on Perceived Ease of Use (PEOU)
- Conscientiousness did not have a significant effect on Perceived Usefulness (PU)
- Conscientiousness did not have a significant effect on Perceived Ease of Use (PEOU)

Furthermore, we recommend that future research is carried out in an attempt to clarify what lies behind such inconsistencies. In fact, in preparation for this research study and by reviewing the existing literature it is evident that personality traits and the degree to which they affect different technologies are highly contextual.

Depending on the type of technology under investigation different negative, positive or neutral correlations between personality traits and the constructs of the technology acceptance model (TAM) could possibly be observed. Because of this contextual nature of the results, we shall not extend the conclusions and findings from our study and sample population to different contexts at large. For instance, in this study, the extroversion construct had a significant effect on PU and PEOU. However, other research studies come to different conclusions because they examine the effects of personality in relation to a completely different type of technology. For instance, Buettner and Ricardo (2016) conduct a study that examines the influence of a user's personality on their attitude towards the adoption of XING which is a European career-oriented social network. Their results indicated that extroversion plays an important role as a significant predictor to the usage of the social network. Logically, such results are to be expected as extrovert individuals are characterized by the much higher necessity for personal communication and social affiliation (Krämer and Winter, 2008). Moreover, it is argued that there is a much higher tendency among extraverts in relation to the usage of social media (Correa, Hinsley, and Zúñiga, 2010) such as Facebook, Instagram, LinkedIn, etc. The findings of their study, however, should come as no surprise as the technology with which they correlate the personality trait of extraversion is meant to have a higher appeal to extroverted personalities to begin with. Because of the fact that social networks are built to connect and increase social capital, it is only natural that people interested in establishing new social relationships would express higher interest in the usage of such technology. On the other hand, introverts who tend to avoid social contacts in the physical world would naturally express less of a desire and behavior intention to create a profile in such virtual media. This type of social element is not present in the context of our research. The robot that we used has not been built with the particular idea in mind to create new social relationships at least not to the extent that a social network strives to do. It could be argued that Alpha 1 pro can be used by friends and families for entertainment purposes which require social behavior that leads to the creation of strong interpersonal bonds in such closed social systems. However, we still cannot argue that the robot has such expressive social importance in the same manner that social media does. The robot does not really have the ability to connect other people as it is not likely that someone will use it to meet strangers and respectively establish new relationships that are craved by extroverts.

Neuroticism, on the other hand, is another personality trait that can exhibit fluctuating values in regard to PU and PEOU. In our specific case, this trait is very relevant as we are considering robotic technology that might be perceived as part of undesired societal changes. With the increasing pace of progression in robotics, machines that once worked for humans or alongside them are now becoming more and more autonomous. As a result, the human approach to life and doing different things is changing fundamentally. Robotics, artificial intelligence, and automation are transforming many different entities across the world: industries, governments, organizations, and society at large. However, many are questioning whether or not we are prepared to make this transition brought by robots and AI and whether we will win more than we will lose. Because of the fact that Alpha 1 pro could be perceived by neurotic personalities as part of some negative trend and consequences that robots could bring to society today or in the near future, it is no surprise that neuroticism proved to have significant explanatory value for our model. However, this could be less true or completely wrong in the context of some other technology that does cause anxiousness in people. Once more, the point is that our theoretical model should be carefully applied and not blindly generalized in other cases without consideration for the existing variables.

This study contributes to the field of robot acceptance and robot adoption research as the model we provide and its psychometric properties that were validated along the way can be used by other researchers as a framework to comprehend the adoption of edutainment (domestic) robots. It is also possible to use the model of this study as a reference point for future research regarding the acceptance of other types of service robots that are designed to operate in different contexts. While the findings should not be taken as a given, our research could still be fruitful material for other studies. Due to significant correlations in the nested model between the personality traits, Perceived Usefulness, Perceived Ease of Use and Behavior Intention to Use the employed edutainment robot, we suggest that our model has a certain level of applicability across different settings as it is able to predict, explain and identify adults intentions to use domestic service robots. Thus, we call for the replication of our study across different settings in order to achieve stronger generalizability of the findings.

Moreover, our research contributes to the literature that examines the interaction between humans and robots. This kind of interaction has been empirically investigated and proves to be influenced by many different aspects including voice, gestures, appearance, culture, countenance, shape, perceived ethics and gender of the robot (Hwang, Park and Hwang, 2013; Nomura, 2017; Bartneck et al., 2005; Lichocki, Kahn, and Billard, 2011). This research study, however, contributes to the extant knowledge regarding the question of how can a successful human-robot interaction be secured in order for the robots to be accepted and achieve their respective goals efficiently. An answer to this question and clear theoretical

conceptualization must be provided as it appears that robots are progressively penetrating all aspects of our lives at a very fast pace. As the world is changing in response to this tendency, we will have to cooperate, work, and interact together with all kinds of robots. Specifically, we focused our efforts on contributing to the literature on human-robot interaction from a personality point of view. During our research study, we have mentioned and exemplified the way in which personality has been related to different types of technologies and its effects in a particular context. However, to our knowledge, there are no prior studies that examine personality effects on the acceptance of the kind of robot employed for the purposes of our research. The topic of personality has been considered by some researchers as something to be simulated by the robot itself. Those studies investigate or only theorize on what type of personality characteristics and behaviors are most appropriate for the robot in question. Therefore, personality is considered from the robot perspective and what type of traits should be simulated by the machine itself. One such example is the study of Lee, Peng, Jin and Yan (2006) that conducts an experiment to examine to what extent participants in the research were able to accurately recognize the robot AIBO personality based on the nonverbal and verbal behavior stimuli demonstrated by the robot. The purpose of the study is to figure out how a robot can simulate personality and is this personality acknowledged as something genuine by people.

Nevertheless, in preparation for this study, we did not encounter any research that attempts to theorize and provide evidence of the effects of human personality traits on the intention to use edutainment robots. We argue that this is a gap of important knowledge because, for example, some people with particular personality traits might be prone to the intention of never even entering into human-robot interactions. Such outcomes can be enforced by their own personality and subconscious beliefs.

Finally, we are confident that the current research study succeeds in expanding the dominant research paradigm from human-computer-interactions (HCI) to human-robot-interactions (HRI). This study advances the theoretical knowledge regarding the predicaments that determine the achievement of successful social interaction between people and robots. Within the paradigm of HCI, numerous research studies have concluded that people tend to respond to agents of computer and software nature in the same way they would naturally respond to real social agents. Factors such as agent behavior, textual content, and appearance in HCI, have been identified as effective instruments that provoke personality-based social responses to form human users towards computers (Moon and Nass, 1996; Nass et al., 1995; Reeves and Nass, 1996). In relation to this, we believe that future research studies will be greatly advanced by applying socio-psychological findings from human-to-human interaction research to HRI. The same strategy was adopted earlier by HCI studies to advance their knowledge of social interactions between humans and computers.

8. Managerial and Practical Implications

There are several important managerial and practical implications of our findings in relation to the yoga industry. In accordance with our results, people with a high level of neuroticism would be predisposed to avoid the acceptance of robots as yoga teachers or yoga partners. On the other hand, individuals high on the personality traits of openness and agreeableness would have a higher inclination towards the acceptance of robots in the yoga context. Hence, robot developers that are building such machines would need to take that into consideration when strategizing on how to sell and market their products. One such consideration could be related to the specific communication tactics and marketing language they chose to employ for promotion. Therefore, we recommend that managers pay more heeds to the literature on marketing language, persuasive communication, and phycological science.

There is extensive research examining how language influences the manner in which consumers interact with brands. It is demonstrated that language effects in brand-related settings have a significant effect on the decision to engage and commit to a brand and products. (Carnevale, Luna and Lerman, 2017). For instance, Paharia, Keinan, Avery and Schor (2011, p.775), investigate the effect of the "underdog narrative" in brand communication. They demonstrate that when firms portray themselves as underdogs by talking about their humble origins, lack of resources, and struggle against the odds there is a positive reflection on "purchase intentions, real choice and brand loyalty". It is also showed that this effect is mediated by consumers' identification with the brand and the effect is bigger for consumers that self-identify as underdogs themselves. This is one of the many examples in academia demonstrating how marketing language that is able to connect on a personal level with consumers can result in better perception of the brand/product which respectively increases the behaviour intention to purchase and engage with an organization.

In regard to our specific case, further research demonstrates that marketing language and persuasive massages "would be more effective when framed to be congruent with the recipient's personality profile." (Hirsh, Kang and Bodenhausen, 2012, p.579). According to the findings, persuasive messages in marketing are much more effective when they are tailored to mirror the concerns and interests of the targeted clientele (Hirsh et al., 2012). Therefore, we have confidence that managers for whom our results would be of interest could benefit by building relevant communication strategy and persuasive massages to target yoga practitioners in regard to the personality traits we have found to be relevant for the acceptance of the technology.

For example, Hirsh, Kang and Bodenhausen (2012) argue that as open individuals look for intellectual stimulation; and are more creative and innovative, they will respond in a significantly more positive manner to messages that reflect those traits. In our research study, we identified openness as a variable that affects positively the PU and PEOU. Therefore, we recommend for robot developers that are trying to sell yoga robots (currently or in the foreseeable future) to put emphasis on the creative and innovative nature of the technology. Moreover, they should emphasize in their communication strategy on how creative and eccentric it is to practice yoga with robots.

Additionally, as neurotic individuals are particularly sensitive to uncertainty and threats (Carver, Sutton and Scheier, 2000), managers could devise a communication strategy that aims to cool down and dismiss possible fears regarding robots' negative influence on the traditional way of yoga practice. Of course, those fears should be first and foremost identified which is a matter with which our research was not concerned.

Because of the fact that agreeable personalities value strongly communal and family relationships (Hirsh et al., 2012), developers of yoga robots must think of a way to present the robot as something that can unite yoga practitioners. For instance, if a company is selling domestic edutainment robots similar to Alpha 1 pro, emphasis could be placed on the ability of the robot to engage the whole family. Particularly they can sell the parents on the idea that with the help of the robot kids will be more willing to practice yoga which will make them healthier and which will also create more memorable moments for the whole family by spending their free time together.

In fact, this communication strategy could be even more relevant for yoga studios that are trying to promote such unusual yoga classes in the near future when the capabilities of the technology will be more advanced (i.e. when the robots are able to replicate all possible yoga poses). Studios interested in that type of futuristic yoga approach can target communities of technology, computer and robot enthusiasts, and professionals who interested in yoga. A yoga studio can appeal to such individuals by describing the class as a place to meet other robot enthusiasts the same way beer yoga classes are promoted as a place to meet other beer enthusiasts (Spencer, 2019).

We believe that this paper provides insights relevant to marketing stakeholders and managers operating within the service robot development industry or in industries that chose to employ such a type of technology as the conclusions of this paper are of significant importance to them as well as to their customers. In relation to the significance of managerial implications, researchers often raise the question about the narrowness of single-industry studies and subsequent weak contributions and usefulness (Kohli, 2011). Additionally, Kohli (2011) reasons that even if a study is limited to a single industry, an argument

could still be made for its significant usefulness depending on how broadly the industry in question is construed. For instance, if a research study is focused on a big enough industry such as healthcare the managerial and practical implications would still be huge and relevant to a lot of marketing stakeholders within such an industry.

In spite of the fact that our findings focused exclusively on an edutainment (domestic) service robot in the context of yoga practice, we believe that our study has broader contributions regarding managerial considerations. This is because of the increasing trend for service robot adoption by a large number of industries and the future prospect for even larger penetration of such technologies into those industries. As we discussed previously, service robots are becoming an essential part of healthcare, hospitality, aviation, education, entertainment (Andelfinger and Hänisch, 2017; Ivanov, et al., 2018; Lui and Lamb, 2018; Schommer et al., 2017) and many more service industries. Therefore, all of the managers that decide to substitute human labor with robots will have to take into consideration the nature of the employed robot and how such technology be perceived through the lenses of customer's personality traits. Depending on the intended purpose of the specific service robot, its functionalities, and the industry in which it is implemented, the Big Five personality traits can moderate the interaction between humans and robots differently.

Not only will the nature of the interaction vary in those different contexts, but the significance of the personality traits will simultaneously fluctuate. Managers must take this into consideration when implementing robots in service delivery processes. Even though the use of service robots could lead to significant resource savings of the organization i.e. costs and time (Ivanov and Webster, 2017), there might be other veiled disadvantages emerging as a result of their implementation which management needs to carefully consider.

Initially, it might seem as if service robots bring only advantages to the organization. However, the fact that a great deal of those robots are taking jobs in the service sector that require interpersonal skills has to also be considered by management. Certainly, we can imagine situations where the substitution of humans with robots appears to be beneficial both to the organization and the customers. For example, certain tasks in the hotel business must be performed urgently on short notice and do not really require a high level of interpersonal communication which involves the personality of the affected parties. A hotel guest urgently needs a towel meaning that an employee would need to leave whatever he/she was doing to deliver it. Those types of sudden requests might disrupt the workflow leading to a reduced level of productivity. Such menial

tasks might as well be entrusted to robots. In fact, the guest might rather prefer those types of requests to be handled by a robot agent.

However, other jobs in hotels such as receptionists or concierges do require higher levels of interpersonal communication within which personality is of utmost importance. Thus, when hospitality businesses are trying to decide whether to substitute human receptionists/concierges with service robots or not, they would have to consider how those robots would be perceived. Sometimes, people might feel uncomfortable communicating with such robots as they would need to provide sensitive information to them (i.e. credit card and personal information). Moreover, managers would have to consider what personality characteristics are most prevalent in their specific customer base that will reflect on the acceptance of the particular technology. For example, five-star hotel guests who are presumably with higher education might be less neurotic towards check-in robots and accept them more easily. The case could be completely different for guests of a hostel.

In addition, managers who take the decision to implement service robots into the business model and service delivery process would need to consider not only the customer's personality in relation to the acceptance of the employed robots. The management would have to think about personality from the workforce perspective as well. After all, in many cases, those robots would need to work together with their human colleagues. This means that the acceptance of such robots by the employees would reflect crucially on the level of productivity and delivery of high-quality service.

Additionally, according to Kohli (2011, p.2), there are cases in which the empirical work conducted in a single industry could be applied to other industries as well "because the nature of relationships among the studied variables" is relevant to other contexts and industries. If that is the case then a single-industry study will not be fatally limited. As previously mentioned, this research study investigated the single industry of edutainment (domestic) service robots by using Alpha 1 pro in the context of yoga teaching. Nonetheless, our research further confirms that the variables of personality traits are of significant importance for the acceptance of one more type of technology. Furthermore, it would be relevant for future research to investigate the effect of personality on other types of robots to fulfill the theoretical and practical knowledge gaps.

9. Suggestions for Future Research

One of our suggestions for future research in regard to robot acceptance in the context of Yoga is the implementation of another robot in the experiment instead of Alpha 1 Pro. We have doubts that certain limitations of the currently used robot such as its small size, not so expressive face characteristics, and inability to perform more complex yoga moves due to its design might have had an effect on the respondent's opinion of the robot. Moreover, participants could have perceived Alpha 1 Pro as just a toy for kids, thus having a negative effect on adults' estimation for its usefulness and ease of use. Therefore, we propose to replicate the current research by utilizing a more sophisticated robot. One such example could be the latest robot of UBTECH named "Walker" which is currently still under development. Nevertheless, the general public has had a chance to see the skills of Walker as well as its updates as it has been presented at the Consumer Electronics Show (CES) for two consecutive years (UBTECH, 2020; UBTECH, 2018). We propose this specific humanoid due to its size as it is about 150 cm tall which resembles a human size. Also, the movements of Walker are much more refined in comparison to Alpha 1 Pro, as the latter struggles in certain situations. Thus, it will be much easier for people to comprehend the exact movements of the robot and replicate the postures on their own. It is a noteworthy aspect as this has a direct effect on the respondent's understanding of perceived usefulness and ease of use. Moreover, it is implemented with AI so the robot will resemble a human being more than Alpha 1 Pro in which we had to prerecord every interaction. Thus, we assume that Walker will be accepted more openly as a moral agent and a Yoga partner or teacher which will ultimately have an effect on the level of its acceptance.

Furthermore, the settings of this study could have a significant impact as mentioned earlier. Similar research is suggested by carrying out an experiment in a live Yoga class setting and not online as it was done in this case due to certain limitations. We presume that if people were able to see the robot in person and interact with Alpha 1 Pro, it might have had an impact on their assessment. This assumption is based on the findings of the earlier mentioned study of Li (2015) who carried out a comparative study between co-present robots, telepresent robots, and virtual agents and indicated the positive association of physically present robots among users in comparison to ones presented digitally on a screen.

Additionally, there is a need for further research that investigates the impact of personality on the technology acceptance model after the robot has been used for a certain amount of time as this paper only records findings measured only after the first interaction with Alpha 1 Pro. The recommendation is provided

due to expectations that during the initial interaction with the robot, the respondents might have had a certain level of interest or excitement that could have biased their perception of the robot. Thus, future measurements after continual use of the technology should be taken in order to clarify the actual reasons that will lead people to adopt a certain technology as well as use it continuously in their everyday life.

Moreover, a more in-depth examination of the specific factors that lead to the acceptance or rejection of robots in Yoga should be carried out. We believe that one way to do that is to employ different variables which will aid in finding further factors that have an impact on robot acceptance. One tool which could be implemented is the Negative Attitude Towards Robots Scale (NARS). It is a scale that aims to explain the differences in participants' behaviour in live Human-Robot Interaction. The scale was developed in Japan and its consistency, validity, and test-retest reliability have been well-established. The measures of the scale are obtained through a questionnaire which contains 14 questions in relation to their attitude towards robots. Moreover, the authors of the scale have divided it in order to better represent the three constructs included in the measurement of the scale. One subscale is named Negative attitudes towards Situations of Interactions with Robots (including six items, e.g. “I would feel uneasy if I was given a job where I had to use robots”), the second one is Negative Attitudes towards Social Influence of Robots (including five items, e.g. “I feel that if I depend on robots too much, something bad might happen.”), and the third subscale represents Negative Attitudes toward Emotions in Interaction with Robots (including three items, e.g. “If robots had emotions, I would be able to make friends with the”) (Nomura, Suzuki, Kanda and Kato, 2006, p.2). By using NARS researchers will be able to further tap into specific situations where certain behaviour towards robots occurs.

Furthermore, it could be utilized as a control variable to test whether there are differences between the specific groups of respondents. For instance, a comparison between demographic variables of people such as gender, education level, or age and their attitude towards robots could be made to better illustrate those relationships. Moreover, NARS could be applied to the different personality traits as well in order to compare attitudes of individuals who differ on the spectrum of personality, thus providing more insights on their perception of perceived usefulness and perceived ease of use.

We urge future research on the topic to consider other variables that could have an effect on the adoption of robots. In our study, we have incorporated the Technology Acceptance Model (Davis et al., 1989) which is criticized to disregard the technology (in our case the robot) as a social agent. After conducting this research, we believe that perceiving a robot as a social actor could be a significant factor in adopting use

behaviour. Hence, we propose that *trust* should also be taken into account as it is suggested to have a significant effect on human-robot interactions. Higher levels of trust assist in forming and preserving effective relationships in HRI which results in individuals recognizing the robot as a collaborative partner (Salem et al., 2015b). Moreover, trust could be examined from different perspectives. Trust could be related to the robot's physical safety meaning that the robot will not injure people or the reliability of the robot's performance meaning that it will function in accordance with its specifications (e.g. it will motivate an individual to do Yoga every day if it is programmed to do so or will pick the most suitable Yoga program for the user's lifestyle) (Salem et al., 2015b). This way of identifying trust will lead to the functional acceptance of the robot which is also the focus of this paper. On the other hand, trust could be considered in the case of the robot's intentions meaning that the robot is expected to have good intentions towards the user (Salem et al., 2015b). For instance, if the robot stores personal or health information to provide a better selection of Yoga courses, it is significant that it does not distribute this information to other parties who can exploit it. Therefore, trust could also lead to social acceptance of robots which potentially could have a stronger effect on their overall acceptance in people's lives.

10. Conclusion

The development of robotics in the last decade has led to the adoption of robots in many industries. However, nowadays robots are not just used in the workplace but also enter the homes of people. Specifically, the level of edutainment robots has been increased significantly. In this paper, we intended to identify if personality has an impact on the acceptance of robots. For this purpose, we have chosen the context of Yoga as a service which could be provided to everyone at home online. This study combines two of the fundamental theories on personality and technology acceptance in order to measure both of the constructs and find whether there are significant relationships between them. To evaluate the personality of the respondents we have implemented the Big Five Personality traits theory and a new model has been proposed in relation to the Technology Acceptance Model (TAM). The new framework measures the effect of each personality trait towards the two main factors within TAM (perceived usefulness and perceived ease of use) that are influencing the adoption of use behaviours. Thus, we are adopting personality as external variables that extend TAM.

In order to carry out this research, the robot Alpha 1 Pro was acquired and used to create a five-minute Yoga class during which the robot showcased different Yoga positions and provided voice instructions on how to execute the specific poses. The video was further distributed online alongside with a questionnaire to record the opinions of the partakers. The sample size for this study was 70 people, consisting of individuals that practice Yoga in Denmark.

Furthermore, we have used SPSS Statistics and Amos software to analyze our data. Structural equation modeling was implemented in order to measure the causal relationships between the constructs in questions. The findings of the study yielded different results in relation to the five dimensions of personality namely Openness to experience, Extroversion, Conscientiousness, Neuroticism, and Agreeableness, and their impact on perceived usefulness and perceived ease of use. The trait of Openness to experience was found to positively correlate with both PU (β=.520) and PEOU (β=.754); Agreeableness indicated a positive relationship with PEOU (b=.487) but no significant relationship was found in relation to PU (β=.196 p=.326 > 0,05). Furthermore, the traits of Extroversion (β PU = -.081/β PEOU= -.052) and Conscientiousness (β PU =.088/ β PEOU=-.062) revealed no significant relationship with either PU or PEOU. On the contrary, Neuroticism was negatively related to both constructs of TAM (β PU = -.557/ β PEOU= -.725). Thus, we conclude that in the specific settings of this research, the higher levels of Openness to experiences and Agreeableness in individuals are determinants of robot acceptance in Yoga practice. Additionally, the hypotheses concerning the constructs within TAM are supported within our study as well.

This study contributes to the information-system literature by showcasing results obtained in a specific context which was not researched up until now. It identifies people who have a positive mindset towards edutainment robots. The paper concludes with recommendations for managerial implications as well as suggestions for future research.

Reference list

Abu-Dalbouh, H. M. (2013). A questionnaire approach based on the technology acceptance model for mobile tracking on patient progress applications. *JCS*, *9*(6), 763-770. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.686.127&rep=rep1&type=pdf

Adams, D. A., Nelson, R. R., & Todd, P. A. (1992). Perceived usefulness, ease of use, and usage of information technology: A replication. *MIS quarterly*, 227-247. Retrieved from https://pdfs.semanticscholar.org/be8a/eabd40db44898df38ecf3a125758864896be.pdf

Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, *50*(2), 179-211. Retrieved from https://www.dphu.org/uploads/attachements/books/books_4931_0.pdf

Ajzen, I., Albarracin, D., & Hornik, R. (Eds.). (2007). *Prediction and change of health behavior: Applying the reasoned action approach*. Psychology Press. Retrieved from https://books.google.dk/books?hl=en&lr=&id=Mvq-h6CWlloC&oi=fnd&pg=PR2&dq=Theory+of+reasoned+action+approach&ots=FxLaQGZtG1&sig=_rPVED_sss36gwMX_5vuuV5NfD0&redir_esc=y#v=onepage&q=Theory%20of%20reasoned%20action%20approach&f=false

Akhtaruzzaman, M., & Shafie, A. A. (2010, October). Evolution of humanoid robot and contribution of various countries in advancing the research and development of the platform. In *ICCAS 2010* (pp. 1021-1028). IEEE. Retrieved from https://www.researchgate.net/profile/Md_Akhtaruzzaman4/publication/224205809_Evolution_of_Humanoid_Robot_and_contribution_of_various_countries_in_advancing_the_research_and_development_of_the_platform/links/00463534f94bdb19a8000000.pdf

Al Hujran, O., Aloudat, A., & Altarawneh, I. (2013). Factors influencing citizen adoption of e-government in developing countries: The case of Jordan. *International Journal of Technology and Human Interaction (IJTHI)*, *9*(2), 1-19. Retrieved from https://www.researchgate.net/publication/262404615_Factors_Influencing_Citizen_Adoption_of_E-Government_in_Developing_Countries_The_Case_of_Jordan

Allport, G. W., & Odbert, H. S. (1936). Trait-names: A psycho-lexical study. *Psychological monographs*, *47*(1), i. Retrieved from http://psych.colorado.edu/~carey/Courses/PSYC5112/Readings/psnTraitNames_Allport.pdf

Amoako-Gyampah, K., & Salam, A. F. (2004). An extension of the technology acceptance model in an ERP implementation environment. *Information & management*, *41*(6), 731-745. Retrieved from https://www.sciencedirect.com/science/article/pii/S0378720603001228?casa_token=pd8KOgyeIGYAAAAA:LlgICUCfMzxWFi2o26vK8d_81xdJzDpYKX2vpmzCPeoMN50tV74lonJFz5-ogMFJ1n83Z-qIu3A

Andelfinger, V. P., & Hänisch, T. (Eds.). (2017). *Industrie 4.0: Wie cyber-physische Systeme die Arbeitswelt verändern*. Springer-Verlag. Retrieved from https://books.google.dk/books?hl=da&lr=&id=nZg7DgAAQBAJ&oi=fnd&pg=PR5&dq=1.%09Andelfinger,+V.+P.+and+H%C3%A4nisch,+T.+(Eds.).+(2017).+Industrie+4.0:+Wie+cyber-

physische+Systeme+die+Arbeitswelt+ver%C3%A4ndern.+Wiesbaden:+Springer+Gabler.+&ots=TxIPCF8dGW&sig=mFhnNYg8VRy83D64-l7iq_L2hMU&redir_esc=y#v=onepage&q&f=false

André, E., & Rist, T. (2001). Controlling the behavior of animated presentation agents in the interface: Scripting versus instructing. *AI Magazine*, *22*(4), 53-53. Retrieved from https://www.aaai.org/ojs/index.php/aimagazine/article/view/1592

Antony, G. M., & Rao, K. V. (2007). A composite index to explain variations in poverty, health, nutritional status and standard of living: Use of multivariate statistical methods. *Public Health*, *121*(8), 578-587. Retrieved from https://www.sciencedirect.com/science/article/pii/S0033350607000339?casa_token=rockrLOqAaoAAAAA:bI09baV6uWrd-LeU3YwrYUB-kk1bTDmY6jEDPaQ9lhG3v5hwwxSw6tD5Bu8ttMH4eHoWTIlfsF0

Asendorpf, J. B., & Wilpers, S. (1998). Personality effects on social relationships. *Journal of personality and social psychology*, *74*(6), 1531. Retrieved from https://www.researchgate.net/profile/Jens_Asendorpf/publication/232486422_Personality_effects_on_social_relationships/links/02e7e51adf9ff66c3e000000.pdf

Ataran, A., & Nami, K. (2011). Examining acceptance of information technology: a longitudinal study of Iranian high school teachers. In *3rd International Conference on Information and Financial Engineering*. Retrieved from http://www.ipedr.com/vol12/34-C040.pdf

Bainbridge, W. A., Hart, J., Kim, E. S., & Scassellati, B. (2008, August). The effect of presence on human-robot interaction. In *RO-MAN 2008-The 17th IEEE International Symposium on Robot and Human Interactive Communication* (pp. 701-706). IEEE. Retrieved from https://ieeexplore.ieee.org/abstract/document/4600749

Baldwin, R. E., & Martin, P. (1999). Two waves of globalisation: superficial similarities, fundamental differences (No. w6904). *National Bureau of Economic Research*. Retrieved from https://www.nber.org/papers/w6904.pdf

Barnett, T., Pearson, A. W., Pearson, R., & Kellermanns, F. W. (2015). Five-factor model personality traits as predictors of perceived and actual usage of technology. *European Journal of Information Systems*, *24*(4), 374-390. Retrieved from https://www.tandfonline.com/doi/full/10.1057/ejis.2014.10?casa_token=bKwS1ar4J_kAAAAA%3A-LLsVQQXpE_hHG3POU3d8JGCQaahFECgJfQmmRmt5R4w8bi-fwsAFM1DSerUsWRsEXptrdFKs1AvnA

Barrick, M. R., & Mount, M. K. (1991). The big five personality dimensions and job performance: a meta-analysis. *Personnel psychology*, *44*(1), 1-26. Retrieved from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1744-6570.1991.tb00688.x?casa_token=dQFVjZxLZ9YAAAAA:ghAfRTOmmatS-U9ibC8bfMoFHTaFuCJQIUoVmyrDZln1bGLjM4iewCDfxmZ1ArpeOrBuMUltGwgOp2zx

Barrick, M. R., & Mount, M. K. (2000). Select on conscientiousness and emotional stability. *Handbook of principles of organizational behavior*, *15*, 28. Retrieved rom https://s3.amazonaws.com/academia.edu.documents/46406951/Organizational_behavior.pdf?response-content-disposition=inline%3B%20filename%3DOrganizational_behavior.pdf&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-

Credential=ASIATUSBJ6BAMQTGT356%2F20200511%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20200511T133157Z&X-Amz-Expires=3600&X-Amz-SignedHeaders=host&X-Amz-Security-Token=IQoJb3JpZ2luX2VjEOP%2F%2F%2F%2F%2F%2F%2F%2F%2F%2FwEaCXVzLWVhc3QtMSJHMEUCICeRmq%2BL9wSSgok0GECByk91qSnWrpXXwhgCnHwDo3SrAiEAqm0p2kvLpCu5bgHXAGIEvCqZ2O7jz0HoDz83H%2FD4uAEqtAMILBAAGgwyNTAzMTg4MTEyMDAiDNQ7%2BULkWkvjG596hCqRAz%2FnJKMstrnJbiDWbGQTFs%2BS76swUp%2FxPFFtcVWLpp7%2B1tBxApgVI9H5uAYzqEMFtkFUDom4xxLWmdnZu%2Fxp1nHDWTrE7Fy8CV44i7%2FzHi3cDAt3AonqnPWcW8wYsgHtOjT8DNIlQP5EM3L7ydAKX9fBzmWSd7%2Frv4jyZ9y0XpDBqDr8ZAbFYr59rFUo6cqcRXOPn8rm9sCyD8KLtp%2B2Sb4BGUmSkfFzoS5dQrWAQHyISWc4r0GzEX5tNwqvuV6pzgHq%2FDkEDb2TFJH0WHv4R60QpcgJk5uZkI%2FOtWO87Gv0kCq60lk9WtBrLsTqzUWrIvgvcy3nJWmtAL%2F1TFsNn%2B4RxcQ%2BOr5mjsnJTHrA446Qdl3r%2B7O7h124ThjOFKkgDSETxX1iyYNHN%2BD9ZuPt%2BYV4VBgClUvX6hDh1hSrDQUV%2BAddq%2F9zW30XZGjggx4s5yJqnOUxpeSgW2AynhwWpbp84iKMnUF092CnmQBlKEaJfjJAmxqioFnRqDoNagLKa4S%2BA3sooUgWzjPPr%2B8c87MIMK3U5PUFOusBQAiJkqvZoUqgT6bJpWvCn6cguCwVe6UDDv3V998WOKyGQafqcg1QR3ClVAxjOv9pJ5fELSYFKokSv2hx5R%2F9PCpf1upQiAzF0Vu3gPpYIKcLzSFPErGPxDT5juXKcUX9G0jrDHujh4pQdwc69TFBR2JImDQGtNf%2FhTQ%2BXGwoQCO%2BrtpxsmLky4%2Fnp4%2FYDdiTe7zpVGmiIDBVtmGLL5MMJjzgvwvni0x%2BzEi%2BUPPDcMk89d6cK5vp3k%2Fyuj5Nripi3KRx0LCNjMKe1BtONs3NoqweIWZfofiDyCgNnBktFSgS3ieVfQySrz%2FJ4w%3D%3D&X-Amz-Signature=56c3ece1978e8188600cb20e9b1d49ccd1684891d3d427909185a3ddc793261b#page=51

Barrick, M. R., Mount, M. K., & Judge, T. A. (2001). Personality and performance at the beginning of the new millennium: What do we know and where do we go next?. *International Journal of Selection and assessment*, *9*(1-2), 9-30. Retrieved from https://onlinelibrary.wiley.com/doi/pdf/10.1111/1468-2389.00160

Bartneck, C., & Forlizzi, J. (2004, September). A design-centred framework for social human-robot interaction. In *RO-MAN 2004. 13th IEEE International Workshop on Robot and Human Interactive Communication (IEEE Catalog No. 04TH8759)* (pp. 591-594). IEEE. Retrieved from http://www.bartneck.de/publications/2004/designCentredFrameworkForSocialHRI/bartneckForlizziROMAN2004.pdf

Bartneck, C., Nomura, T., Kanda, T., Suzuki, T., & Kato, K. (2005). Cultural differences in attitudes towards robots. AISB. Retrieved from https://ir.canterbury.ac.nz/bitstream/handle/10092/16849/bartneckAISB2005.pdf?sequence=2

Bartneck, C., Reichenbach, J., & Breemen, V. A. (2004). In your face, robot! The influence of a character's embodiment on how users perceive its emotional expressions. Retrieved from https://ir.canterbury.ac.nz/handle/10092/16924

Bartneck, C., Suzuki, T., Kanda, T., & Nomura, T. (2007). The influence of people's culture and prior experiences with Aibo on their attitude towards robots. *Ai & Society*, *21*(1-2), 217-230.Retrieved from https://link.springer.com/article/10.1007%2Fs00146-006-0052-7

Behrenbruch, K., Söllner, M., Leimeister, J. M., & Schmidt, L. (2013, September). Understanding diversity–the impact of personality on technology acceptance. In *IFIP Conference on Human-Computer Interaction* (pp. 306-313). Springer, Berlin, Heidelberg. Retrieved from https://link.springer.com/content/pdf/10.1007/978-3-642-40498-6_23.pdf

Borghans, L., Duckworth, A. L., Heckman, J. J., & Ter Weel, B. (2008). The economics and psychology of personality traits. *Journal of human Resources*, *43*(4), 972-1059. Retrieved from http://jhr.uwpress.org/content/43/4/972.short

Bouwman, M. E., Kommers, P. A., & Van Deursen, A. J. (2014). Revising TAM for hedonic location-based social networks: the influence of TAM, perceived enjoyment, innovativeness and extraversion. *International journal of web based communities*, *10*(2), 188-210. Retrieved from https://s3.amazonaws.com/academia.edu.documents/44535563/Revising_TAM_for_hedonic_location-based_20160408-4451-8pg2pv.pdf?response-content-disposition=inline%3B%20filename%3DRevising_TAM_for_hedonic_location-based.pdf&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=ASIATUSBJ6BAEY7YCOV6%2F20200511%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20200511T131938Z&X-Amz-Expires=3600&X-Amz-SignedHeaders=host&X-Amz-Security-Token=IQoJb3JpZ2luX2VjEOX%2F%2F%2F%2F%2F%2F%2F%2F%2F%2FwEaCXVzLWVhc3QtMSJGMEQCICN38LpQ91EvmUMBFaBHv5BFocRTMFNNiiQ0oMULnklfAiAjThtwTzxWEoAx2r1opgvHVajVVI7kleOmwBtHDEtw8iq0AwguEAAaDDI1MDMxODgxMTIwMCIMyhVTBusPgyJq8rpLKpEDUGyKdZYF7g5luu0wu2PF4zuzqHVryzHEL%2B%2FzJu0zxdOgOdQeLPfKGIHTI8wCOcVJr3mPLVxMELtSgHesS5FeGJP%2Foj5mbWjBiV5QL3zksz%2Fft4SSkjGAq21IV0yEjgpjRMFVjgHGDfSuZ8M2fXfCkdWzCuKJPWF74ljPTIkwIF18nqzKbutWW6MCLeiGoHlCI1k1ZTXZzeOJjrszC%2Fnso%2FKgRF0Ef1Kyv%2B1%2FrpTF2CBLmCUvZ6Hl2UoWG1hLkgXicXFm8MZGwT9vuiIm1f8raR25ABRVyyJm8iJ2SZn2pMADUxr8OWv%2FKP9LoxueLWIQaYYwuTQdKiKOowXjHrI7xA4JjTVOVsXhDPbQRlGvE386CwhXV1MFp3pnyKJdZyp4DMCI93YQR5%2F3o5VC7Qc8lbnMyI3GkccaKvlB6jNBg6PohluXPTNGbwiHRUBNrQOAUMcXDHUhTGOhSA9BdP68L8dMl5HtSXMfa1w0pdLdzBKJeF8bQrWvNfcrAOKyi9i3q5goCqaqBOEaCdRhnG2ygBIwo43l9QU67AE6f2Daak6SZ0RMwFTogzJCDGyTavEezmqOpWF6lHu74AbAS7hnebGkC%2BVhNw6%2BBFp8egd8CW2Dwm6%2BAbYkbYcxh2Ip%2F1xRBn1vqKam4Uoy%2FzyqPlD11YKUK8JDTSE%2FXPH5rzpR9C7v%2BlslvBctAgQ%2FadtxORXa4VSH8e%2FK2aYKPP6tMk4BYQjQDoRf3Kch%2BcZ2SVV4duOCjxHkaaPdHdP%2B5ogVxbpEJcb6G3KHVM5Q5tNyvki2Rx%2B7gAmPq0PO9sz4cFpHroy6PlRWB3lipZV%2F7VGymMm9TI1xjV4%2F7lYc99Bn5FP1J5Fija7AvQ%3D%3D&X-Amz-Signature=f640cd7748c9cd2534acb4a86ff84f272e531d525a6b37790131eff8cc604809

Brown, S. A., Massey, A. P., Montoya-Weiss, M. M., & Burkman, J. R. (2002). Do I really have to? User acceptance of mandated technology. *European journal of information systems*, *11*(4), 283-295. Retrieved from https://www.tandfonline.com/doi/abs/10.1057/palgrave.ejis.3000438?casa_token=9R6exAJwD3wAAAAA:8psaFiA7TgHj6IOtWVdmVahJqa2m5bqLoL6ueBT9MjvNZynH36elEXyujZTTOBxE4avfgfm8MRwVkw

Bryman, A. (2016). *Social research methods*. Oxford university press.

Brynjolfsson, E., & McAfee, A. (2014). *The second machine age: Work, progress, and prosperity in a time of brilliant technologies*. WW Norton & Company.

Buettner, R. (2016, June). Personality as a predictor of Business Social Media Usage: an Empirical Investigation of Xing Usage Patterns. In *PACIS* (p. 163). Retrieved from https://aisel.aisnet.org/cgi/viewcontent.cgi?article=1160&context=pacis2016

Cano-García, F. J., Padilla-Muñoz, E. M., & Carrasco-Ortiz, M. Á. (2005). Personality and contextual variables in teacher burnout. *Personality and Individual differences*, *38*(4), 929-940. Retrieved from https://www.sciencedirect.com/science/article/pii/S0191886904002223?casa_token=eKdR_-N1J6QAAAAA:aF1QyjWq3Jwmpv6BhWjQA_6OCqhA-keiCaCODjeUpx2NQLXv7AXXNT72cGZ0YC3FhlnZ7q2bK4k

Carnevale, M., Luna, D., & Lerman, D. (2017). Brand linguistics: A theory-driven framework for the study of language in branding. *International Journal of Research in Marketing*, *34*(2), 572-591. Retrieved from https://www.sciencedirect.com/science/article/pii/S0167811617300058?casa_token=yVRed4gSEAkAAAAA:5_1lVc7pSp6_yqv_7jp0geoD26dIayAmBnY7Ju5z5PNCu8QVnGe6ZKkntUGNVXDkFQMBkzSXPAA

Carver, C. S., Sutton, S. K., & Scheier, M. F. (2000). Action, emotion, and personality: Emerging conceptual integration. *Personality and social psychology bulletin*, *26*(6), 741-751. Retrieved from https://journals.sagepub.com/doi/pdf/10.1177/0146167200268008?casa_token=8I84SGIrigkAAAAA:JagZcE1QjXT4M-As9LBZk8pkSlmdZI4K00InoeyMHTqceu0atET-9Ly35jT_tr-ooxYDyIxs2Rx9ig

Cattell, H. E., & Mead, A. D. (2008). The sixteen personality factor questionnaire (16PF). *The SAGE handbook of personality theory and assessment*, *2*, 135-178. Retrieved from https://books.google.dk/books?hl=da&lr=&id=NOeann4wvo4C&oi=fnd&pg=PA135&dq=attell,+HEP,+Mead,+AD.+The+sixteen+personality+factor+questionnaire+(16PF)&ots=-mNK2Zlzhy&sig=Cprq9ioNKuUkW0CxP1OAwSNWYgE&redir_esc=y#v=onepage&q&f=false

Chang, C. C., Yan, C. F., & Tseng, J. S. (2012). Perceived convenience in an extended technology acceptance model: Mobile technology and English learning for college students. *Australasian Journal of Educational Technology*, *28*(5). Retrieved from https://ajet.org.au/index.php/AJET/article/view/818

Chau, P. Y., & Hu, P. J. H. (2002). Investigating healthcare professionals' decisions to accept telemedicine technology: an empirical test of competing theories. *Information & management*, *39*(4), 297-311. Retrieved from https://www.sciencedirect.com/science/article/pii/S0378720601000982?casa_token=q5-ApmhWdkoAAAAA:iz-BS-5UsXmutejz6Ry_8C_eBgCT9M-OKWMNC4RF3SsibddoJgHAbTfHsbc6HG6VMazgRWyY5XA

Chen, H., Rong, W., Ma, X., Qu, Y., & Xiong, Z. (2017). An extended technology acceptance model for mobile social gaming service popularity analysis. *Mobile Information Systems*, *2017*. Retrieved from http://downloads.hindawi.com/journals/misy/2017/3906953.pdf

Cherry, K. (2019, September 29) The Trait Theory of Personality. *Verywell Mind.* Retrieved from https://www.verywellmind.com/trait-theory-of-personality-2795955

Chin, W. W., & Todd, P. A. (1995). On the use, usefulness, and ease of use of structural equation modeling in MIS research: a note of caution. *MIS quarterly*, 237-246. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.458.4729&rep=rep1&type=pdf

Chokkalingam, P. S., Kumari, S., Akhilesh, K. B., & Nagendra, H. R. (2015). An Empirical Study to Improve Performance Oriented Personality Dimensions through Yoga Intervention. *Siddhant-A Journal of Decision Making*, *15*(3), 236-242. Retrieved from http://www.indianjournals.com/ijor.aspx?target=ijor:sjdm&volume=15&issue=3&article=009

Cobb-Clark, D. A., & Schurer, S. (2012). The stability of big-five personality traits. *Economics Letters*, *115*(1), 11-15. Retrieved from https://www.sciencedirect.com/science/article/pii/S0165176511004666?casa_token=98IauuQPGQMAAAAA:eq71LY4UnYcddBF2ssetZW5UErVhV2xGf4wlsjqAWtcGj1trDd6KRHTViVbglx_4qj-VOVq3mio

Cooper, J., & James, A. (2009). Challenges for database management in the internet of things. *IETE Technical Review*, *26*(5), 320-329. Retrieved from https://curve.coventry.ac.uk/open/file/4d33fbf8-d7fb-98f4-405d-0fe5c0c92d68/1/Challenges%20for%20Database%20Management%20in%20the%20Internet%20of%20Things%20Cooper%20J,%20James.pdf

Correa, T., Hinsley, A. W., & De Zuniga, H. G. (2010). Who interacts on the Web?: The intersection of users' personality and social media use. *Computers in human behavior*, *26*(2), 247-253. Retrieved from https://www.sciencedirect.com/science/article/pii/S0747563209001472?casa_token=CH647G6Ks3QAAAAA:qU58EeQZ4gQDXT5N7BiLBQr_EXUtMkZVqN8NzJyc1enX8fOQ3XnnFoxUzaEkfMYAFmyiNc3eYcs

Costa Jr, P. T., & McCrae, R. R. (2008). *The Revised NEO Personality Inventory (NEO-PI-R)*. Sage Publications, Inc. Retrieved from http://sk.sagepub.com/reference/hdbk_personalitytheory2/n9.xml

Costa Jr, P. T., McCrae, R. R., & Dye, D. A. (1991). Facet scales for agreeableness and conscientiousness: A revision of the NEO Personality Inventory. *Personality and individual Differences*, *12*(9), 887-898. Retrieved from https://s3.amazonaws.com/academia.edu.documents/48357447/Facet_Scales_for_Agreeableness_and_Consc20160827-19774-58stry.pdf?response-content-disposition=inline%3B%20filename%3DFacet_scales_for_agreeableness_and_consc.pdf&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=ASIATUSBJ6BAAX5NOU5P%2F20200511%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20200511T133828Z&X-Amz-Expires=3600&X-Amz-SignedHeaders=host&X-Amz-Security-Token=IQoJb3JpZ2luX2VjEOb%2F%2F%2F%2F%2F%2F%2F%2F%2F%2FwEaCXVzLWVhc3QtMSJHMEUCIAa55MIzx4v2GvuPGKepWKnSo8Ut7Lcuz4Q8l6jZqOjaAiEAk%2BtvAzu48DRPLGzrroCtDR3cGSvCCYEzWuzus%2B0xFMEqtAMILhAAGgwyNTAzMTg4MTEyMDAiDImj%2BMAnCEkKJpq1FSqRAxtwBJrU%2FUyUOI8x%2Bwm45xjUXKfBGydCopzjsce0iepTokwM0jtUpqmYrQ87Cg0vjmwE79umEHmjNGlbHVMcu%2BCm0%2F451aRq%2FmNPY%2FXumIu1Zerdav4D3AMOxMmsa2kKZ4zNgKMSs5z%2BDGEPuSsS0EFltNZownkBz2GdG2w0aS8sLczAw21eE33eZLD4p9V7l%2FS0jxo8cSmQ5nHteQfWMmVK0ooJxWCchAnpuZyU8J9MxtcoTSt1R4U5MLFL4OmejQeiP93f3p4WxoB3fUKGBBBZftp69MFxfRTPheaSMGEj0vRBTGm5KEVLQFy7hBMIPoE3HRCEdxGsqBnLfQGnnm6umAbGoSapT51%2BhEr3FzTyJ3ph783uXCtJpt%2F3uEnY13D%2BaIvdtKQ7qQKH0uCSsLuWbo5jvV4VZ2I5Nes7nLOK%2FNXhX61QvmKSVrQplpQPIimlQSp%2F0OptGfDrcBcILF4p%2BI%2FXctqLAdbV58vTk6zG32MDXF2BnNOOjR9S6XeT0iDjDkXGq9QZLYlTEteAIe4%2BMIKh5fUFOusBstL9kZ254lEfHhAlAZPLylvC7bWkzCcdZVO88eUvvZQxYX2NDRBNf8zPZBMWC9B2CtkgB2FQBcHEB2zPQiShP%2FuK%2BgCl7EY%2BtwlXK0eBkZ06prhhdnWTLsQoo5WWepTzUGgOBnyOnv%2Bpjdeh96GtOfm11QD8UMYNkLaOvRxOSLUUBIU%2BFnBf0zaUtAPoYR2VGimehzZBois7xwmYyRvHLRl%2BpTQNGahiCZLOn%2F4nMe4EHFQlRpX9aT0Zh8UPAjhRvGHC6nJigelUdOKqTx7Dh%2BasWg3eHYr2vwKXLlbeEccc1kHaF8J3TQNPpw%3D%3D&X-Amz-Signature=8a1b1c9ae95b934e3e3043350b604ff3c07866e824d7128b21737116e5ee1e7d

Crook, J. (2014). Starwood introduces robotic butlers at Aloft hotel in Cupertino. *Tech Crunch.* Retrieved from https://techcrunch.com/2014/08/13/starwood-introduces-robotic-butlers-at-aloft-hotel-in-palo-alto/?guccounter=1

Daffodil Robotic Lab. (2017, March 7). *ALPHA* [Press release]. Retrieved from http://daffodilrobotics.com/products/topic/32

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, 319-340. Retrieved from https://www.researchgate.net/profile/Fred_Davis2/publication/200085965_Perceived_Usefulness_Perceived_Ease_of_Use_and_User_Acceptance_of_Information_Technology/links/54ad66dc0cf24aca1c6f3765.pdf

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management science*, *35*(8), 982-1003. Retrieved from https://www.researchgate.net/publication/227446117_User_Acceptance_of_Computer_Technology_A_Comparison_of_Two_Theoretical_Models

Deahl, D. (2018, June 28). Honda retires its famed Asimo robot. Retrieved from https://www.theverge.com/2018/6/28/17514134/honda-asimo-humanoid-robot-retire

Devaraj, S., Easley, R. F., & Crant, J. M. (2008). Research note—how does personality matter? Relating the five-factor model to technology acceptance and use. *Information systems research*, *19*(1), 93-105. Retrieved from https://pubsonline.informs.org/doi/pdf/10.1287/isre.1070.0153

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: the tailored design method*. John Wiley & Sons. Retrieved from https://books.google.dk/books?hl=da&lr=&id=fhQNBAAAQBAJ&oi=fnd&pg=PR11&dq=Dillman,+D.+A.,+Smyth,+J.+D.,+and+Christian,+L.+M.+(2009).+Internet,+Mail,+and+Mixed-Mode+Surveys:+The+Tailored+Design+Method.+3rd+edn.+Hoboken,+NJ:+Wiley&ots=JvS1qnTIBN&sig=gs3NArhVDiXnhM-usv0tK3HCTPY&redir_esc=y#v=onepage&q=Dillman%2C%20D.%20A.%2C%20Smyth%2C%20J.%20D.%2C%20and%20Christian%2C%20L.%20M.%20(2009).%20Internet%2C%20Mail%2C%20and%20Mixed-Mode%20Surveys%3A%20The%20Tailored%20Design%20Method.%203rd%20edn.%20Hoboken%2C%20NJ%3A%20Wiley&f=false

DiSalvo, C. F., Gemperle, F., Forlizzi, J., & Kiesler, S. (2002, June). All robots are not created equal: the design and perception of humanoid robot heads. In *Proceedings of the 4th conference on Designing interactive systems: processes, practices, methods, and techniques* (pp. 321-326). Retrieved from https://dl.acm.org/doi/pdf/10.1145/778712.778756

Domaine, H. (2006). *Robotics*. Lerner Publications.

Feil-Seifer, D., & Mataric, M. J. (2009). Human RobotInteraction. *Encyclopedia of complexity and systems science*, *80*. Retrieved from https://rrl.cse.unr.edu/media/documents/2016/585.pdf

Feuerstein, G. (2003). *The deeper dimension of yoga: Theory and practice*. Shambhala Publications. Retrieved from

https://books.google.dk/books?hl=da&lr=&id=QKWmOAnl8KwC&oi=fnd&pg=PR11&dq=Feuerstein,+2003+yoga&ots=cPfFtC536r&sig=b93sjQZ-tAen5Ho4e_Afq8fa9gs&redir_esc=y#v=onepage&q=Feuerstein%2C%202003%20yoga&f=false

García-Santillán, A., Wurzinger, A. E., & Tejada-Peña, E. (2015). What factors explain the anxiety level towards the study of mathematics among elementary school students?. *Mediterranean Journal of Social Sciences*, *6*(4), 564-564. Retrieved from http://www.richtmann.org/journal/index.php/mjss/article/view/6965

Gebhart, A. (2019, January 7). Ubtech's soccer-playing Walker robot has a new pair of arms at CES 2019. Retrieved from https://www.cnet.com/news/ubtechs-walker-now-has-arms-too-ces-2019/

George, B. (2002). The relationship between lottery ticket and scratch-card buying behaviour, personality and other compulsive behaviours. *Journal of Consumer Behaviour: An International Research Review*, *2*(1), 7-22. Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.1002/cb.86

Gockley, R., & MatariĆ, M. J. (2006, March). Encouraging physical therapy compliance with a hands-off mobile robot. In *Proceedings of the 1st ACM SIGCHI/SIGART conference on Human-robot interaction* (pp. 150-155). Retrieved from https://dl.acm.org/doi/abs/10.1145/1121241.1121268

Goetz, J., Kiesler, S., & Powers, A. (2003, November). Matching robot appearance and behavior to tasks to improve human-robot cooperation. In *The 12th IEEE International Workshop on Robot and Human Interactive Communication, 2003. Proceedings. ROMAN 2003.* (pp. 55-60). Ieee. Retrieved from https://ieeexplore.ieee.org/abstract/document/1251796

Goldberg, L. R. (1992). The development of markers for the Big-Five factor structure. *Psychological assessment*, *4*(1), 26. Retrieved from https://projects.ori.org/lrg/PDFs_papers/Goldberg.Big-Five-Markers-Psych.Assess.1992.pdf

Gong, M., Xu, Y., & Yu, Y. (2004). An enhanced technology acceptance model for web-based learning. *Journal of Information Systems Education*, *15*(4). Retrieved from https://aisel.aisnet.org/cgi/viewcontent.cgi?article=1551&context=jise

Gonzalez-Pacheco, V., Ramey, A., Alonso-Martín, F., Castro-Gonzalez, A., & Salichs, M. A. (2011). Maggie: A social robot as a gaming platform. *International Journal of Social Robotics*, *3*(4), 371-381. Retrieved from https://link.springer.com/content/pdf/10.1007/s12369-011-0109-8.pdf

Grate, R. (2020, February 11) Yoga Statistics: Surprising Data on the Growth of Yoga. *Eventbrite Blog.* Retrieved from https://www.eventbrite.com/blog/yoga-statistics-demographics-market-growth-trends-ds00/

Hakkak, M., Vahdati, H., & Biranvand, V. (2013). An extended technology acceptance model for detecting influencing factors: An empirical investigation. *Management Science Letters*, *3*(11), 2795-2804. Retrieved from http://growingscience.com/msl/Vol3/msl_2013_305.pdf

Hamburger, Y. A., & Ben-Artzi, E. (2000). The relationship between extraversion and neuroticism and the different uses of the Internet. *Computers in human behavior*, *16*(4), 441-449. Retrieved from https://www.sciencedirect.com/science/article/pii/S0747563200000170?casa_token=W_qOCgmRkTMAAAAA:TKE7tY--MTNKvsA3MIwVRjD3RWUEvzAc4BPB0uzKp-zpu3AGvSXfO3vO_648QraU7JdQBmINIhc

Haring, K. S., Matsumoto, Y., & Watanabe, K. (2013). How do people perceive and trust a lifelike robot. In *Proceedings of the world congress on engineering and computer science* (Vol. 1). Retrieved from https://s3.amazonaws.com/academia.edu.documents/32402493/WCECS2013_pp425-430.pdf?response-content-disposition=inline%3B%20filename%3DHow_Do_People_Perceive_and_Trust_a_Lifel.pdf&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=ASIATUSBJ6BAKHNYHGNJ%2F20200511%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20200511T112459Z&X-Amz-Expires=3600&X-Amz-SignedHeaders=host&X-Amz-Security-Token=IQoJb3JpZ2luX2VjEOL%2F%2F%2F%2F%2F%2F%2F%2F%2F%2FwEaCXVzLWVhc3QtMSJHMEUCIQC3TvLF8vpsRof1Gg38QOVwlRMTH50lcwQTfNgx4W2HaQIgRhvMGQ0h6UGA2B61%2F16ms%2Bo2ma%2FtyobwhIyzrJ2f5eAqtAMIKhAAGgwyNTAzMTg4MTEyMDAiDKhN4kHBrermy%2FukDCqRA%2FTT6qlpHjpWSCn7nLtj42dVUqjyYxblDYvDvoB6Tbb5DG9HVE7s9iC9WfAOruAlkwFOD%2FTWOWgBRGFmNVMx2SJK%2FhlcJ8TbTWhSiAdcmflvXOJi%2BBhxU%2Fuh8vFThs%2FKRQT1CUzXPi7ZkrtkeaYIYwBrQiShidbNM42uvA59vladj2Njv7Ma0MxkQvmKY8OHKy1NQfLzy11zOa2tDqoLhQQSWTlA00g7Xs9BJyBQv5dHSJw3AAi%2BfuS4Iqqck5OZxaAr1KRmm1JYYVUdedvqtP3Wk3uKCjxMdjIOa22gyNJsS%2F26ItfTl8onEjnQwjU2GTrDNLwkBYsD8yoGS%2FfX%2BrvacavC7KPs68JAW0F1gLyro%2BaRhjOpI8QFmvpN2KPixccX%2F5MF7RbjKZneyDUJtr8jhMzeE6Nxh6AVI2VOoqNETUoqQVtoE9hAMnzc%2FYxAJzBEyce4sq%2B8BWxLFh2z3QFk6OfPHZzYD%2BJeY9OLqSUaeagbrtJNrEy2ON4AFzQCiAGAL9uJw0n%2BJNGfL%2FqtpLPbMM2r5PUFOusBzRNkl7hXN4qj0y3ybWPhLWczdOabHgeWJqQQWklySgXgD%2Fir9sHsZDt%2Be9F9xG%2BcCk1t1cllg1LBBm2TLoTqlhHl46AUT%2FnNLhEXY91X15pn0tyKKqDYMssecHzpai%2FVnmM7LoXhhr%2BpWuH2%2FSxMcSA3aadGd6S6Mbtak1W9q4smocOImjOLnZYt7i0PCqnlDcVTvM6ivqzmFWfIc4IttHsLwYSDWRDDUex5kl4EjmgquVDnKLDKmcLGIPpddf%2FVII3w%2BctdnHGsqm%2BbnaxH38OHX1pcykWHA77a5n4Lb%2BIeuj2yhYMZCVGGPg%3D%3D&X-Amz-Signature=b8907790c43a53524f6f56e5d2637c16c640bf924b48da3f7aeb71a1bd5a6f00

Harvard University (n.d.) *Gordon W. Allport*. Retrieved from https://psychology.fas.harvard.edu/people/gordon-w-allport

Hendrickson, A. R., & Latta, P. D. (1996). An evaluation of the reliability and validity of Davis' perceived usefulness and perceived ease of use instrument. *Journal of Computer Information Systems*, *36*(3), 77-82. Retrieved from https://www.tandfonline.com/doi/abs/10.1080/08874417.1996.11647210

Higgins, E. T. (2000). Does personality provide unique explanations for behaviour? Personality as cross-person variability in general principles. *European Journal of Personality*, *14*(5), 391-406. Retrieved from https://onlinelibrary.wiley.com/doi/pdf/10.1002/1099-0984(200009/10)14:5%3C391::AID-PER394%3E3.0.CO;2-6?casa_token=u22Pt9Tq-qAAAAAA:nFdwi3qf1ILaahRehOwDehBzXpDP90SaTvN0vFOa2XxerR7VihvH-YTecRUG1DbivRBow-nbZ5kZ8Dkq

Hirsh, J. B., Kang, S. K., & Bodenhausen, G. V. (2012). Personalized persuasion: Tailoring persuasive appeals to recipients' personality traits. *Psychological science*, *23*(6), 578-581. Retrieved from https://journals.sagepub.com/doi/full/10.1177/0956797611436349?casa_token=uDas7anZzKIAAAAA:3Hj1wkQ9DecoBEgudw3vPIi1MPgFTt6sSE1ueXYSG7rf4BAaEJSZ8Ypi2QQohNbmwyTp2eIuMOhGTw

Holm, A. B. (2013). *Philosophy of science: An introduction for future knowledge workers*. Samfundslitteratur. Retrieved from https://books.google.dk/books?hl=da&lr=&id=UGnl0T3a60cC&oi=fnd&pg=PA11&dq=Holm,+A.+B.+(2013).+Philosophy+of+Science.&ots=kBVxBQKSq6&sig=UvWW449d3CnWgInLiA1SF-gryU4&redir_esc=y

Hwang, J., Park, T., & Hwang, W. (2013). The effects of overall robot shape on the emotions invoked in users and the perceived personalities of robot. *Applied ergonomics*, *44*(3), 459-471. Retrieved from https://www.sciencedirect.com/science/article/pii/S0003687012001688?casa_token=2giJoXtAhLgAAAAA:CYveIukxmeguo6WKCOz3ia0dgT6vW2dlz7oE4FtsTuaBqsr9ytc5xQr9wrH6fTfBYNX83xJqh5s

IBM. (n.d.) *IBM SPSS software* Retrieved from https://www.ibm.com/analytics/spss-statistics-software

International Federation of Robotics. (2020). *Executive Summary World Robotics 2019 Service Robots*. Retrieved from https://ifr.org/downloads/press2018/Executive_Summary_WR_Service_Robots_2019.pdf

International Federation of Robotics. (2020). *Executive Summary World Robotics 2019 Industrial Robots*. Retrieved from https://ifr.org/downloads/press2018/Executive%20Summary%20WR%202019%20Industrial%20Robots.pdf

International Federation of Robotics. (2020). *Topics and Definitions*. Retrieved from https://ifr.org/

International Personality Item Pool. (2019) *International Personality Item Pool.* Retrieved from https://ipip.ori.org/

International Personality Item Pool. (2019) *Interpreting Individual IPIP Scale Scores.* Retrieved from https://ipip.ori.org/InterpretingIndividualIPIPScaleScores.htm

International Personality Item Pool. (2019) *Multi-Construct IPIP Inventories.* Retrieved from https://ipip.ori.org/newMultipleconstructs.htm

Isbister, K., & Nass, C. (2000). Consistency of personality in interactive characters: verbal cues, non-verbal cues, and user characteristics. *International journal of human-computer studies*, *53*(2), 251-267. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.330.9050&rep=rep1&type=pdf

Ivanov, S. H., & Webster, C. (2017). Adoption of robots, artificial intelligence and service automation by travel, tourism and hospitality companies–a cost-benefit analysis. *Artificial Intelligence and Service Automation by Travel, Tourism and Hospitality Companies–A Cost-Benefit Analysis*. Retrieved from https://s3.amazonaws.com/academia.edu.documents/53959355/Adoption_of_robots_by_tourist_companies_-_a_CBA_-_full_text.pdf?response-content-disposition=inline%3B%20filename%3DADOPTION_OF_ROBOTS_ARTIFICIAL_INTELLIGEN.pdf&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=ASIATUSBJ6BACR4JIOXM%2F20200511%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20200511T135931Z&X-Amz-Expires=3600&X-Amz-SignedHeaders=host&X-Amz-Security-Token=IQoJb3JpZ2luX2VjEOX%2F%2F%2F%2F%2F%2F%2F%2F%2F%2FwEaCXVzLWVhc3QtMSJHMEUCIQCx5Uv5950cIqVgtcCyPDzhTTudn8Gs%2FQ49UYqiH%2FnL7QIgYeqMpWLqhIl9XLqiNZR1NpJ3I2NqspWeAjy6QIRbuMcqtAMILhAAGgwyNTAzMTg4MTEyMDAiDHzbDLDSSv9LNnPXkiqRA3yCQtMQA69tIKnpHDWWZFSlCrvSVLisrFyUAq7kYErgoi4wpMOi5wVtuJ1jxvxypGCQj6f0JM

7w7svW8bZ8YJU7gyMTceEfIGOYo0vbMbdCW30t%2Bo6w90zULboP19haZPalkBOMhp9INdHxYzS
bWfh5lq%2B0fd5GVpR4bXWiXFW9I9L2mgTdGnqSW4cIiCF45xczomAqRsitPyh2H4FQcXeYgabwC
KWXT2V%2B5zLNfaPePFaypz%2BEvXQqIaXuVJRjEVtDVNUTyT9aRmvRkz8XL1NJCbtUKP%2Fh
pu9EbyK42%2Fh4SL1li6U6oq6TxfGTYJUtpN%2B%2FEuvH5JojuyB%2F42gWKGuodBRimECnrWv
6za1IQAwFxZgINGMWxz%2FKzeCzpzCAM9CzEvU6sz0JQOwlhxhkj9ng%2FM%2Fp20SQ%2Bp6nN
CvWdz3HYSZ5XZl%2BpbjlB4QaV6X1KmcpeLJMXbpyOVmrnGBr61VCxrlsCkD0frObFJT0i%2BbX
40rASZ9w76Vr%2BHICgq%2Bir7jQbmgtkUfeo3g9RfNEDlihMN%2BI5fUFOusBhZq9yaXaN3did31oz
%2F6PIWUp9lh1NJZX17SNFQU8McULW7UcMB%2FsAebDJ8iz%2FbN1E2Fh0E0frP810R09abcsGh
x9Rp9Y8BhlSoaaO0WnnGFriIu7I0HObhVB6QasvBKFJ8DWLZkUCpmpXufT0YppbOgNcFhRx8xqn
%2FivDNU0JJ2Vh5O%2F%2BlB6YvI3816R%2FWlex97p9aYMKVH9RpkyJJeW5T8PtoAlWlP1W0Y
YFgOJfLJVrrw5qp8%2BzUDyX7BFnciNXIfizixzz2LiJBAClIDLr122peUEiSj%2BzPyF84gzCopzFB5N
ANtQAa1naA%3D%3D&X-Amz-
Signature=e8fd08cf40f8f3faf736dec1ecc5874d753507c5c643ea0ba93a798102e49072

Ivanov, S., Webster, C., & Garenko, A. (2018). Young Russian adults' attitudes towards the potential use of robots in hotels. *Technology in Society*, *55*, 24-32. Retrieved from https://www.sciencedirect.com/science/article/pii/S0160791X17302981?casa_token=oxxzyXkjXBsAAA
AA:ibSfqJLsHQfhMosr1wGG7xFS773ufV3irrz-ft6irk3BEmfBAC1TiC2NwyMQd-AQSxQx2-pRkV4

Jen-Hwa Hu, P., Lin, C., & Chen, H. (2005). User acceptance of intelligence and security informatics technology: A study of COPLINK. *Journal of the American Society for Information Science and Technology*, *56*(3), 235-244. Retrieved from https://onlinelibrary.wiley.com/doi/full/10.1002/asi.20124?casa_token=3QVBB_7BDUYAAAAA%3Al2
l7480Mw7OXhmbQaUt8bWjvRm69kbw1SzguXcc72jljhhnQpwRUbS9G3TP13J94Vz39ZVuPWyNim-
TK

Jensen, M.B. (2020, March 29). Robot med opfordring: - Husk at bruge håndsprit. Retrieved from https://www.tv2nord.dk/aalborg/robot-med-opfordring-husk-bruge-
haandsprit?fbclid=IwAR2uEgfQpX5aRe2u8BiXKJeun_4NY4yjfsJqdtIBMktGAoAVIvSJggN4m6U

John, O. P., & Srivastava, S. (1999). The Big Five trait taxonomy: History, measurement, and theoretical perspectives. *Handbook of personality: Theory and research*, *2*(1999), 102-138. Retrieved from http://t.personality-project.org/revelle/syllabi/classreadings/john.pdf

Judge, T. A., & Ilies, R. (2002). Relationship of personality to performance motivation: A meta-analytic review. *Journal of applied psychology*, *87*(4), 797. Retrieved from https://home.ubalt.edu/tmitch/641/judge%20ilies%20personality%20and%20perfor%202002.pdf

Judge, T. A., Erez, A., Bono, J. E., & Thoresen, C. J. (2002). Are measures of self-esteem, neuroticism, locus of control, and generalized self-efficacy indicators of a common core construct?. *Journal of personality and social psychology*, *83*(3), 693. Retrieved from https://www.researchgate.net/publication/11169311_Are_Measures_of_Self-
Esteem_Neuroticism_Locus_of_Control_and_Generalized_Self-
Efficacy_Indicators_of_a_Common_Core_Construct

Judge, T. A., Heller, D., & Mount, M. K. (2002). Five-factor model of personality and job satisfaction: A meta-analysis. *Journal of applied psychology*, *87*(3), 530. Retrieved from https://s3.amazonaws.com/academia.edu.documents/38296208/five_factor_model_of_job_satiscation1.pd

f?response-content-disposition=inline%3B%20filename%3DFive-Factor_Model_of_Personality_and_Job.pdf&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=ASIATUSBJ6BAJHBYAPOZ%2F20200511%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20200511T133241Z&X-Amz-Expires=3600&X-Amz-SignedHeaders=host&X-Amz-Security-Token=IQoJb3JpZ2luX2VjEOP%2F%2F%2F%2F%2F%2F%2F%2F%2F%2FwEaCXVzLWVhc3QtMSJHMEUCIHrjwL4kyE5SyfMvHQhJIYptiNM1c5cBz9etmFMM7MClAiEAgSZzD3LhiPG9oRRYcrfAK3C6NakcpoS2rvMqsYPE6kYqtAMILBAAGgwyNTAzMTg4MTEyMDAiDA4BHdF22z3AcRkWbCqRAzmmB4UsBi5ix6nLxPlxNWWERZ%2F0l9f8m6DTzV670WgxkdEV7nV1RjSRHAIkTFuWSykoZSik6hXbpEfDwMtM6IcoJc3LpbJXZZNOz011%2FmIBZH9QRQeZQGb%2Bx3cEZGv2JanMzSJ3FrGYUKuIJDqzR44doKQM2HJkPjrRyTi3TO0c5Awyj2iC7XMFjP%2ByuZcWYssHhsyyS4sD1w7ii7FATtosMDAmnwb5ZAorN7UQM3%2F4P6bOjxe9hTR3jr2MMbCwJYGEdPnaTXrdm19RTmqeIG0083WOefhXf137%2FpfckCCYXFyWWKilx40sSU8BwFUF0pDPhY1iXK8tngiQcLgatHHTTNPXhdZizFpSxpHGPQAoE1DLhwsDPXJIFfj25XezzFpseFua2sCBUan1VKL%2Fyq3wVlQEhXx20Rkrs4K%2FN%2Fj95S3%2FIGv%2B1yC7AXHqlr6vOXdr79fzu1s%2BcIZLxj5DclJTG97qzpUJupMDTzeNhvXW%2BqQjX%2BT1z5ysuAOaTHjNSHFJOtbjC3UsLV4aH3uEpzePMJbb5PUFOusB7P%2BM10BjFThlcmmj6SKsLbOdg7kI%2FBrhLBKhiC2m2HBdoBkKlg1wZlwW5izSqe%2FOhDu%2FOOLU6rPA%2BEqOg8k9gw56tdfMiYsCvBxyub2Lz%2BNk%2BEWYY96TolVhcfICqHmXquMKICl3YyOC%2B%2B7Dx0oPju12GPqIjlmq5ctG1BmL30MeEoCHdtyMs9Ze57QctMUVXsgajJv9tErO34%2BxurlO1QcAJi3dijNAanLEVHOUBR59EKfYsWwX3ZwB%2Fivan8alEufi%2BR3tFmIlpDQHRJFsv6d%2Fsv59nYusURzEs0RQVAliWZkBGNK6%2Fmj2YQ%3D%3D&X-Amz-Signature=c3da36c3099c74410b158a5fa49b4b9a7f86f5c3acafade7361be20521d9315e

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika*, *39*(1), 31-36. Retrieved from http://cda.psych.uiuc.edu/psychometrika_highly_cited_articles/kaiser_1974.pdf

Kaiser, H. F., & Rice, J. (1974). Little jiffy, mark IV. *Educational and psychological measurement*, *34*(1), 111-117. Retrieved from https://journals.sagepub.com/doi/pdf/10.1177/001316447403400115?casa_token=Nb0R6521Ip4AAAAA:VuW62Avhrez0dimsZzRVQ2tUAkyryLid08bqDFXU8F-p5DZv7J02--t1AW1eulJ-DNG9H_6KK0Agzg

Kanda, T., Miyashita, T., Osada, T., Haikawa, Y., & Ishiguro, H. (2008). Analysis of humanoid appearances in human–robot interaction. *IEEE Transactions on Robotics*, *24*(3), 725-735. Retrieved from https://www.researchgate.net/profile/Takayuki_Kanda/publication/220396348_Analysis_of_Humanoid_Appearances_in_Human-Robot_Interaction/links/00b49524e1351d4bef000000/Analysis-of-Humanoid-Appearances-in-Human-Robot-Interaction.pdf

Kaplan, F. (2004). Who is afraid of the humanoid? Investigating cultural differences in the acceptance of robots. *International journal of humanoid robotics*, *1*(03), 465-480. Retrieved from https://pdfs.semanticscholar.org/0c0d/e209758eae40e59598782466a138606275e6.pdf

Kim, J. (2005). User acceptance of web-based subscription databases: Extending the technology acceptance model. Retrieved from https://diginole.lib.fsu.edu/islandora/object/fsu:181256/datastream/PDF/view

Koch, S., Toker, A., & Brulez, P. (2011). Extending the technology acceptance model with perceived community characteristics. *Information Research*, *16*(2), 16-2. Retrieved from

https://www.researchgate.net/publication/289791384_Extending_the_Technology_Acceptance_Model_with_perceived_community_characteristics

Kohli, A. K. (2011). From the editor: reflections on the review process. *Journal of Marketing*, *75*(6), 1-4. Retrieved from https://journals.sagepub.com/doi/10.1509/jm.75.6.editorial

Kose-Bagci, H., Ferrari, E., Dautenhahn, K., Syrdal, D. S., & Nehaniv, C. L. (2009). Effects of embodiment and gestures on social interaction in drumming games with a humanoid robot. *Advanced Robotics*, *23*(14), 1951-1996. Retrieved from https://s3.amazonaws.com/academia.edu.documents/39255468/09e41509bae618fddc000000.pdf?response-content-disposition=inline%3B%20filename%3DEffects_of_Embodiment_and_Gestures_on_So.pdf&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=ASIATUSBJ6BAETUZWVU2%2F20200511%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20200511T133116Z&X-Amz-Expires=3600&X-Amz-SignedHeaders=host&X-Amz-Security-Token=IQoJb3JpZ2luX2VjEOb%2F%2F%2F%2F%2F%2F%2F%2F%2F%2FwEaCXVzLWVhc3QtMSJHMEUCIHN0Mi37FhOPGQTQjdHpuHqvC3P%2BF8FH%2BhQsFSrEdTX9AiEAjANm64VepfoUZiaEjBp8YWB7GmkQu4pOtpZLaEXP1HcqtAMILhAAGgwyNTAzMTg4MTEyMDAiDCP5MNZgEVpQHZ0B5SqRA8dwWHl7pooByjHJL4cHaM5Xov6Oebi8SwTHs0YTGdo9ZiF7BRbZuFEwxGMGtEJQXIN%2B9oyPoE8Zb8NrFWGJiWgWkKRA8I9sN2nN7VuEpX%2FpTervb6gTPZKKAExBkZFJzpQu%2BVfkfcCs3aUz%2BbG%2F3NEC7IsLHzB%2BGbyuJH%2BvSJgawVWxQQrI0RPg0klDz68eZtB1tdonUKKVlAcce0cvCaJWD%2F9EVwUcOlXtIqeHOFq17w5PQFzF%2FnUeZZzPcOor5IqxYottWdV6HusPf%2B6S%2BURN56%2B1lwWgSVUFojTxKAUCjX1g3E0CxbyReovjM%2BjN%2F6c4RGg4A7gBIpc7uhGOkImElPLfbuHxYgMV4H1OuEe3ItbPLzdtsMcPSafzVeMuZHydMQUqD9yiWuU73EgwyAVWmpehWP3dOgpcyOhnwbDLjdiy6Hv4kxp9bzOSOAV7oAd%2BeSyfcyfNtj3rY9af%2FwKbxsvOg%2B28iPEfZh%2BRhAbtoEDCfGB%2FfTewqoUYh3W%2BSIhtSKKdHdU%2BoyCYGoO3sXy9MKqb5fUFOusBjFPLd2LXt%2FNd4zD0DH90FkCuEa0Jkova5CKPa4L91QmYShd7QzA%2Fwt1GsrvvINqDshM47I2385tQOt6D%2Bu%2BaLf3YzwQpnyq1c2E6upduL76iilrNPGeFRwRXEcl2Qd5YWKTd3%2BPNK9A1ZzpIG2C0qPajEQo7dhNYsbAqr1f%2F2FD51xnrb%2FDvmWE1WKlwRJqpod6mQ8pgn%2F0jZl%2B9MKFgLErTt2D1tZChboPkvrwv%2BuXrXkollTrkAaCnn5LEEKwRHiH28WVtKITuehRMZgK7TBAad90Q9v%2Bg2BY3Bdhyjb8NAuAqk67KFA%2B00w%3D%3D&X-Amz-Signature=153e9847a134e2ef76dfe9524eeabe52a9a830046c83bf5829fb79c74ac75274

Krämer, N. C., & Winter, S. (2008). Impression management 2.0: The relationship of self-esteem, extraversion, self-efficacy, and self-presentation within social networking sites. *Journal of media psychology*, *20*(3), 106-116. Retrieved from https://s3.amazonaws.com/academia.edu.documents/54905421/ImpressionManagement20.pdf?response-content-disposition=inline%3B%20filename%3DImpression_Management_2.0_The_Relationsh.pdf&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=ASIATUSBJ6BAAFXBUWNU%2F20200511%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20200511T135223Z&X-Amz-Expires=3600&X-Amz-SignedHeaders=host&X-Amz-Security-Token=IQoJb3JpZ2luX2VjEOX%2F%2F%2F%2F%2F%2F%2F%2F%2F%2FwEaCXVzLWVhc3QtMSJIMEYCIQDELtYOMS06yxfs4aDXSGO475JMqAe%2BJP0gAdEqOozXEQIhALPFuR7rEl2Ut%2F1jhi%2F8nJwf3bo9na9fLP3g8W3%2BSCYtKrQDCC4QABoMMjUwMzE4ODExMjAwIgznPCkSfWbeV9q

rpcYqkQMAaKjC5mGLIp0eIu5CqExB3L74VT8OIOqxfCK089mcHgRAPBEoP4hp1EfI1%2FhmYmO
QxVJj5J1HitU66EOKoNwPO3tPXLGbvIKKoCjpZpEHc5iTbw%2FD14IBYG%2B6Q%2BwOeKqKT4J
VZmmQwi5a1ps1GG0TzCVegaIC3WOwW1%2FzAl1gdDlBsYscqMExKBceV605NrGGxdQfisfWcm
MDyh4LsUohcvwPS4Yu47W%2Bzta2%2FGjBQHkv%2FQYkdcp9Sa9jt2aT0H3IN8QJgQpJFAUh6SU
29%2FrpzaXgAtfPeyg1tRegQV9WHcggqsuvLQvho0L1VnZy0SzTCJL4xqrYKsR9lU66WHniBwcRuO
%2B31uI54wljYbdgS5xMnxXtu8wbQ6kGULXaJxlLk6NpEhdSSa%2FkDrRmsWkyn3gMmJ5DQE5r58
dPlEC74lhs1S3f2wlhfsbYY%2BH9PbeciGY%2Bs1qg%2FW2N5MDiGRm54csbkzJewo7EO3ZcNHGI
REKKdxvHecpSHHfUQm19VLqVnB%2BQvzOgEOIIoG6d%2FT2o9TCBmeX1BTrqAaizFJN7lo9gYV
5luGZ4uZs1rIOGa5ybEMgFRfIWtOsEpCmUIYZEjAwVwf5asYWghhWcLztrW4P4CcD7m4kmJtDsK
NIrGZW8DZwPa9CMyS%2BtkeiTH0%2F54ES45yz8%2FGJCfbJFzeyZTME2H7qxPgb%2FLv8feZgN
W73gH8YJs48j%2F0XattTyHceExY6%2Fw0%2BqZkAt5Efs46kiDr8JOGq273ZKkSEHpRcbNiwDsw
%2BimRufsgCnSnkKfDUhHv9OM2499v4VnsAVOftz%2BQzWn7mdmzXvichjxyNhwDZf0QlqiJHhFX
p6zwfjCUqdPQ2FKQ%3D%3D&X-Amz-
Signature=b003f09dac22af86a5735509178ceebecf97b3534fb580b68fc2bb9ae6f93807

Kwak, S. S., Kim, Y., Kim, E., Shin, C., & Cho, K. (2013, August). What makes people empathize with an emotional robot?: The impact of agency and physical embodiment on human empathy for a robot. In *2013 IEEE RO-MAN* (pp. 180-185). IEEE. Retrieved from https://ieeexplore.ieee.org/abstract/document/6628441

Lebowitz, S. (2016). Scientists say your personality can be deconstructed into 5 basic traits. *Business Insider*. Retrieved from https://www.businessinsider.com/big-five-personality-traits-2016-12?r=US&IR=T

Lee, K. M., Jung, Y., Kim, J., & Kim, S. R. (2006). Are physically embodied social agents better than disembodied social agents?: The effects of physical embodiment, tactile interaction, and people's loneliness in human–robot interaction. *International journal of human-computer studies*, *64*(10), 962-973. Retrieved from https://www.sciencedirect.com/science/article/pii/S1071581906000784?casa_token=YzQc17lH8Z0AAAAA:s031DU__CRRTKrF8NdH-GRZCVZlyhBWeT2gkj9tJQYfHgSl8DtAh1zx1F3R9qDC3Vi0VNaVzH3w

Lee, K. M., Peng, W., Jin, S. A., & Yan, C. (2006). Can robots manifest personality?: An empirical test of personality recognition, social responses, and social presence in human–robot interaction. *Journal of communication*, *56*(4), 754-772. Retrieved from https://academic.oup.com/joc/article/56/4/754/4102572?casa_token=8fU7W5FI7rwAAAAA:YMdAuXup8CbcNfoC0VZjwPfnQZMPIpaS0n6DWy7Qv7Cz2hctrFEP1317RnF9xochFpDmSuqczrWKJA

Lehto, X. Y., Brown, S., Chen, Y., & Morrison, A. M. (2006). Yoga tourism as a niche within the wellness tourism market. *Tourism Recreation Research*, *31*(1), 25-35. Retrieved from https://www.tandfonline.com/doi/pdf/10.1080/02508281.2006.11081244?casa_token=3PtJZKb2SQ4AAAAA:8ZK2ep4DXkEQVLrpQBLIR4ulZAyK5FT7hj0f5r8d82GUXus_Dl69KcXuk5zALYICo6niUXC9iz3U5Q

Letchumanan, M., & Muniandy, B. (2013). Migrating to e-book: a study on perceived usefulness and ease of use. *Library Hi Tech News*. Retrieved from https://www.emerald.com/insight/content/doi/10.1108/LHTN-05-2013-

0028/full/html?casa_token=sZ5vWtG7LGMAAAAA:VX5BLAQk5cOPxWCgyXJD4i9GyEjIJwobAq-QG5adx7O-rQN5lTvuEPu0rv_D-dVvZcNfyJWujbb1GxTRMlD9mO3MrSUr5IxkO461W8AjZ4yHPwj31MRT

Li, J. (2015). The benefit of being physically present: A survey of experimental works comparing copresent robots, telepresent robots and virtual agents. *International Journal of Human-Computer Studies*, *77*, 23-37. Retrieved from https://www.sciencedirect.com/science/article/pii/S107158191500004X?casa_token=WOhZWHHCdBcAAAAA:jCJ9yPpiVvUlR9KL-ctlJ7dXR4fte0RT1HeaI8L_6skYDwDx4__IFmjMv61mV7wEy6yxLSP-mDQ

Łichocki, P., Billard, A., & Kahn, P. H. (2011). The ethical landscape of robotics. *IEEE Robotics & Automation Magazine*, *18*(1), 39-50. Retrieved from https://ieeexplore.ieee.org/abstract/document/5751972

Lu, Y. (2017). Industry 4.0: A survey on technologies, applications and open research issues. *Journal of Industrial Information Integration*, *6*, 1-10. Retrieved from https://www.sciencedirect.com/science/article/pii/S2452414X17300043?casa_token=33hS7HX7lLEAAAAA:emDMvLcyfcWxZnYT41Wg6d3AYfzhV6sjDjS0esihdaWxZDS3VVhoBTu7Qxh2OtJE6q3J1_R7LVY

Lui, A., & Lamb, G. W. (2018). Artificial intelligence and augmented intelligence collaboration: regaining trust and confidence in the financial sector. *Information & Communications Technology Law*, *27*(3), 267-283. Retrieved from https://www.tandfonline.com/doi/full/10.1080/13600834.2018.1488659?casa_token=Tn3IXuTGqbMAAAA%3A7th7ELSXEVu27WwysilaJpEqRevLVLE5Rn8sFvvE4YE-aTTbIaxT7IBP022-8ZfR4xPcBMn3oltC4g

Lund, H. H., & Pagliarini, L. (2001). Edutainment robotics: Applying modern ai techniques. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.11.6143

Massachusetts Institute of Technology. (2019, November 12). *Learning From Automation Anxiety of the Past*. Retrieved from https://sloanreview.mit.edu/article/learning-from-automation-anxiety-of-the-past/

Mathieson, K., Peacock, E., & Chin, W. W. (2001). Extending the technology acceptance model: the influence of perceived user resources. *ACM SIGMIS Database: the DATABASE for Advances in Information Systems*, *32*(3), 86-112. Retrieved from https://dl.acm.org/doi/pdf/10.1145/506724.506730

McCrae, R. R., & Costa Jr, P. T. (1994). The stability of personality: Observations and evaluations. *Current directions in psychological science*, *3*(6), 173-175. Retrieved from https://journals.sagepub.com/doi/pdf/10.1111/1467-8721.ep10770693?casa_token=PKdo_evvJNYAAAAA:zWkYlA_X8a936KsQzm2m5_VcdQKuh6pDwuVPCT9F8bHwKW3HFX5AYrstEdjB0tKxrGSoancbmEPzIA

McCrae, R. R., & Costa Jr, P. T. (1997). Conceptions and correlates of openness to experience. In *Handbook of personality psychology* (pp. 825-847). Academic Press. Retrieved from https://www.sciencedirect.com/science/article/pii/B9780121346454500329

McElroy, J. C., Hendrickson, A. R., Townsend, A. M., & DeMarie, S. M. (2007). Dispositional factors in internet use: personality versus cognitive style. *MIS quarterly*, 809-820. Retrieved from https://www.researchgate.net/profile/James_Mcelroy/publication/220259923_Dispositional_Factors_in_Internet_Use_Personality_Versus_Cognitive_Style/links/59f9c997aca27221807e8d9f/Dispositional-Factors-in-Internet-Use-Personality-Versus-Cognitive-Style.pdf

McLeod, S. (2017) Theories of Personality. *Simply Psychology*. Retrieved from https://www.simplypsychology.org/personality-theories.html#allport

Mishra, D., Akman, I., & Mishra, A. (2014). Theory of reasoned action application for green information technology acceptance. *Computers in human behavior*, *36*, 29-40. Retrieved from https://www.sciencedirect.com/science/article/pii/S0747563214001526?casa_token=etdt2VVTqVsAAAAA:bY1EgLvtpF9fjK-O-E7MITkWzdJnByUAjGUpHBBj49Xf4i4KUuE6hzIs3MUfzfxS9JWoDA_RI3U

Mokyr, J. (1998). The second industrial revolution, 1870-1914. *Storia dell'economia Mondiale*, *21945*. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.481.2996&rep=rep1&type=pdf

Moon, J. W., & Kim, Y. G. (2001). Extending the TAM for a World-Wide-Web context. *Information & management*, *38*(4), 217-230. Retrieved from https://www.sciencedirect.com/science/article/pii/S0378720600000616?casa_token=rERbn6CRmyYAAAAA:HfRX5RFKk7q-qiHSn71hmnZrwMn-otQQ3uHuTyZk8ZcNuIB6EayXEIxoL0ULSQGZh5RhDA5XgBw

Moon, Y., & Nass, C. (1996). How "real" are computer personalities? Psychological responses to personality types in human-computer interaction. *Communication research*, *23*(6), 651-674. Retrieved from https://journals.sagepub.com/doi/pdf/10.1177/009365096023006002?casa_token=meEtw2Xl3ooAAAAA:_V7MeQA-gK93Fpx-yxjHkyh_G-bbuadC67QCpIE_gbfHzDnGbYw8C9h-N1JoadREWRG9aP-Gq0cFvA

Moore, G. E. (1965). Cramming more components onto integrated circuits. *Electronics*, *38*. Retrieved from https://www.cs.csub.edu/~melissa/cs350-f15/notes/Doc/gordon_moore_1965_article.pdf

Mueller, C. (2019, October 30). Market for Professional and Domestic Service Robots Booms in 2018. Retrieved from https://ifr.org/post/market-for-professional-and-domestic-service-robots-booms-in-2018

Müller, S. L., & Richert, A. (2018, June). The Big-Five Personality Dimensions and Attitudes to-wards Robots: A Cross Sectional Study. In *Proceedings of the 11th PErvasive Technologies Related to Assistive Environments Conference* (pp. 405-408). Retrieved from https://dl.acm.org/doi/pdf/10.1145/3197768.3203178

Nair, I., & Das, V. M. (2012). Using Technology Acceptance Model to assess teachers' attitude towards use of technology as teaching tool: A SEM Approach. *International Journal of Computer Applications*, *42*(2), 1-6. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.259.3844&rep=rep1&type=pdf

Nass, C., Moon, Y., Fogg, B. J., Reeves, B., & Dryer, C. (1995, May). Can computer personalities be human personalities?. In *Conference companion on Human factors in computing systems* (pp. 228-229).

ACM. Retrieved from https://www.researchgate.net/profile/Christopher_Dryer/publication/220106730_Can_computer_personalities_be_human_personalities/links/02e7e515d6df230616000000.pdf

Nederhof, A. J. (1985). Methods of coping with social desirability bias: A review. *European journal of social psychology*, *15*(3), 263-280. Retrieved from https://onlinelibrary.wiley.com/doi/pdf/10.1002/ejsp.2420150303?casa_token=EHwmNnF0s6oAAAAA:P59lSTiYL_Le-W4pyln45gmAtQINIlPS2fYWkQ38AcZvu1qIZla01qJWHgiCO6xdR8RXvnsUBKVSUwzc

Neisser, U., Boodoo, G., Bouchard Jr, T. J., Boykin, A. W., Brody, N., Ceci, S. J., ... & Urbina, S. (1996). Intelligence: knowns and unknowns. *American psychologist*, *51*(2), 77. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.322.5525&rep=rep1&type=pdf

Nezlek, J. B., Schütz, A., Schröder-Abé, M., & Smith, C. V. (2011). A cross-cultural study of relationships between daily social interaction and the Five-Factor Model of personality. *Journal of personality*, *79*(4), 811-840. Retrieved from https://onlinelibrary.wiley.com/doi/full/10.1111/j.1467-6494.2011.00706.x?casa_token=sd0LvuTia0QAAAAA%3AcNBc3VHXaX6snByjgqi3CUjkRhQDGMLtSh9rwAs_HwUeMWMmV4GPUyUVktpsMezsreXJH-e6MCMhZkQI

Nomura, T. (2017). Robots and gender. *Gender and the Genome*, *1*(1), 18-25. Retrieved from https://journals.sagepub.com/doi/pdf/10.1089/gg.2016.29002.nom

Nomura, T., & Kinoshita, Y. (2015, October). Gender stereotypes in cultures: experimental investigation of a possibility of reproduction by robots in Japan. In *2015 International Conference on Culture and Computing (Culture Computing)* (pp. 195-196). IEEE. Retrieved from https://ieeexplore.ieee.org/abstract/document/7433256

Nomura, T., Suzuki, T., Kanda, T., & Kato, K. (2006). Measurement of negative attitudes toward robots. *Interaction Studies*, *7*(3), 437-454. Retrieved from http://rins.st.ryukoku.ac.jp/~nomura/docs/RAS_ROMAN06.pdf

Nor, K. M., Shanab, E. A. A., & Pearson, J. M. (2008). Internet banking acceptance in Malaysia based on the theory of reasoned action. *JISTEM-Journal of Information Systems and Technology Management*, *5*(1), 03-14. Retrieved from https://www.scielo.br/scielo.php?script=sci_arttext&pid=S1807-17752008000100002

O'Brien, P. (2006). Provincializing the first industrial revolution. *London School of Economics*. Retrieved from http://eprints.lse.ac.uk/22474/1/wp17.pdf

Ofori-Kuragu, J. K., Baiden, B., & Badu, E. (2016). Critical success factors for Ghanaian contractors. *Benchmarking: An International Journal*. Retrieved from https://www.emerald.com/insight/content/doi/10.1108/BIJ-03-2014-0018/full/html?casa_token=z880Q9TVRd8AAAAA:MRrJns7fGUvtgcuD39Q7v-pMxrhWmZlrt2NLiZTM9OFheovZos7fl9YVKJTp7XzY2GGLpJzn9aMwzr7oi7UoS3qf8s99HhIsHN_vlDV5QfJ51GmbcGfw

Organisation for Economic Co-operation and Development. (2018). *Is the Last Mile the Longest?: Economic Gains from Gender Equality in Nordic Countries*. OECD. Retrieved from

https://www.oecd.org/publications/is-the-last-mile-the-longest-economic-gains-from-gender-equality-in-nordic-countries-9789264300040-en.htm

Özbek, V., Alnıaçık, Ü., Koc, F., Akkılıç, M. E., & Kaş, E. (2014). The impact of personality on technology acceptance: A study on smart phone users. Retrieved from http://dspace.balikesir.edu.tr/xmlui/bitstream/handle/20.500.12462/8457/volkan-ozbek.pdf?sequence=2&isAllowed=y

Paharia, N., Keinan, A., Avery, J., & Schor, J. B. (2011). The underdog effect: The marketing of disadvantage and determination through brand biography. *Journal of Consumer Research*, *37*(5), 775-790. Retrieved from https://watermark.silverchair.com/37-5-775.pdf?token=AQECAHi208BE49Ooan9kkhW_Ercy7Dm3ZL_9Cf3qfKAc485ysgAAAoQwggKABgkqhkiG9w0BBwagggJxMIICbQIBADCCAmYGCSqGSIb3DQEHATAeBglghkgBZQMEAS4wEQQM7GeqCfE4TJiwiGFSAgEQgIICN2NDQTIdZ9UFrxijtWvwTbZ2Q4qIQRyCYkc50gB_5ckWMMOL9gMJtEnxE9xdDKDeB9cg_G1vCpNhapjmt802jnN6jk7u0M0Hk52EeELUdwaM-H9qZrj8V4-nYKmL6TdxcKN8Xvk-_2cODGboN3uWtIsDEpuOwKwPTLFV9UiSfnURISBgPPxgrXS_pr6gypBdHp4xSFplXhCGwIlrt6lOhcFMoUhY-BOEWZPNMWMT6wGORB1brZnS0GR747fm143rk2Yug8U-QGg_ujCV20h1GK625iPGtv1vp6c-ZW3jWgW0uwShGT43TGX3BKbyEt29VnPgCOwrVO0PMJ-10WB6CRqVN0yTHhkCMHudxgCM36KzuJN8B0a50z9DOnfUdHKazERIcymUrx5osQnZaebyji_AFvh8a3j2o6nnbwEvIuUMxS-hyDKtYTKm40wxIApAAiIwIP92SrVN-suDsW0i7g0TWA8UNfSzg6p-8mPFayamOoBZPD05GtOCjt5SBiPuboCZUhNcS83U5DYnrRV0CyK6HYvpo63BGYznDJmXvDkqJ410NY3Veflu_qZGYkCtJCHRJDA2C8yZF0GE_3qClo7VKwUZhWWKA7mVeixkT60OkmD8Nmcbk47g-R8vHnqejBE7dImqkcqrJvHyD6nfY3Zjut9p0M0eQQTob8nWl2Cc4OPbC3t6pGPjWP2CuEjbqGKoXxIOjZdUxMfhF3LgcfSzjn03jx2BuS58FtaUGsMkEzD5I9mBOA

Pai, F. Y., & Huang, K. I. (2011). Applying the technology acceptance model to the introduction of healthcare information systems. *Technological Forecasting and Social Change*, *78*(4), 650-660. Retrieved from https://www.sciencedirect.com/science/article/pii/S0040162510002714?casa_token=uuslgGYq0JMAAAAA:LdmxxuhxJQBxsBFV-AVeEaNKTHPLHULYbdcfLCHi9uG0GbySZccseJfk8oUE0ZsKsrQ16fZnpg0

Park, S. Y. (2009). An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning. *Journal of Educational Technology & Society*, *12*(3), 150-162. Retrieved from https://www.jstor.org/stable/pdf/jeductechsoci.12.3.150.pdf

Pawson, H. (2018, January 9) Helping hand: HMSHost's Pepper robot lands at three new North American airports Retrieved from https://www.moodiedavittreport.com/helping-hand-hmshosts-pepper-robot-lands-at-three-new-north-american-airports/

Popper, K. (2014). *Conjectures and refutations: The growth of scientific knowledge*. Retrieved from https://books.google.dk/books?hl=da&lr=&id=zXh9AwAAQBAJ&oi=fnd&pg=PP1&dq=2.%09Popper,+K.R.+(1974).+Conjectures+and+Refutations:+The+Growth+of+Scientific+Knowledge.+London:+Routledge+and+Kegan+Paul.&ots=psR9DHo4-2&sig=jEZJ9PqW0PO14DMIwyilCNvr13Q&redir_esc=y#v=onepage&q&f=false

Posada, J., Toro, C., Barandiaran, I., Oyarzun, D., Stricker, D., de Amicis, R., ... & Vallarino, I. (2015). Visual computing as a key enabling technology for industrie 4.0 and industrial internet. *IEEE computer graphics and applications*, *35*(2), 26-40. Retrieved from https://pdfs.semanticscholar.org/4384/1f77823211bffe41222fd944b65e2a1d012b.pdf

Power, R. A., & Pluess, M. (2015). Heritability estimates of the Big Five personality traits based on common genetic variants. *Translational psychiatry*, *5*(7), e604-e604. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5068715/

Prieto, J. C. S., Migueláñez, S. O., & García-Peñalvo, F. J. (2014, October). Mobile learning adoption from informal into formal: an extended TAM model to measure mobile acceptance among teachers. In *Proceedings of the Second International Conference on Technological Ecosystems for Enhancing Multiculturality* (pp. 595-602). Retrieved from https://dl.acm.org/doi/pdf/10.1145/2669711.2669961

Punnoose, A. C. (2012). Determinants of intention to use eLearning based on the technology acceptance model. *Journal of Information Technology Education: Research*, *11*(1), 301-337. Retrieved from https://www.learntechlib.org/p/111507/

Reeves, B., & Nass, C. I. (1996). *The media equation: How people treat computers, television, and new media like real people and places*. Cambridge university press. Retrieved from https://psycnet.apa.org/record/1996-98923-000?fbclid=IwAR3YUdjKMsnE_Z5c3Qf8AyY9du_Kxma2AAo7NVTaBJgy1ux2u0ogpABC6Uo

Rehman, T., McKemey, K., Garforth, C., Huggins, R., Yates, C. M., Cook, R. J., ... & Dorward, P. T. (2003). Theory of Reasoned Action and Its Integration with Economic Modelling in Linking Farmers' Attitudes and Adoption Behavior-An Illustration from the Analysis of the Uptake of Livestock Technologies in the South West of England (No. 1027-2016-82057). Retrieved from https://ageconsearch.umn.edu/record/24319/

Rhodes, R. E., & Smith, N. E. I. (2006). Personality correlates of physical activity: a review and meta-analysis. *British journal of sports medicine*, *40*(12), 958-965. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2577457/

Roblek, V., Meško, M., & Krapež, A. (2016). A complex view of industry 4.0. *Sage Open*, *6*(2), 2158244016653987. Retrieved from https://journals.sagepub.com/doi/full/10.1177/2158244016653987

Robotlab. (2020) *PEPPER ROBOT ACADEMIC EDITION* Retrieved from https://www.robotlab.com/store/pepper-academic-edition

Rosen, P. A., & Kluemper, D. H. (2008). The impact of the big five personality traits on the acceptance of social networking website. *AMCIS 2008 proceedings*, 274. Retrieved from https://aisel.aisnet.org/cgi/viewcontent.cgi?article=1276&context=amcis2008

Rossi, S., Santangelo, G., Staffa, M., Varrasi, S., Conti, D., & Di Nuovo, A. (2018, August). Psychometric evaluation supported by a social robot: Personality factors and technology acceptance. In *2018 27th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)* (pp. 802-807). IEEE. Retrieved from http://shura.shu.ac.uk/23283/1/ROMAN18_roman2018.pdf

Salem, M., Lakatos, G., Amirabdollahian, F., & Dautenhahn, K. (2015). Towards safe and trustworthy social robots: ethical challenges and practical issues. In *International conference on social robotics* (pp.

584-593). Springer, Cham. Retrieved from https://uhra.herts.ac.uk/bitstream/handle/2299/18650/ICSR2015_SalemEtAl_submitted2.pdf?sequence=2&isAllowed=y

Salem, M., Lakatos, G., Amirabdollahian, F., & Dautenhahn, K. (2015). Would you trust a (faulty) robot? Effects of error, task type and personality on human-robot cooperation and trust. In *2015 10th ACM/IEEE International Conference on Human-Robot Interaction (HRI)* (pp. 1-8). IEEE. Retrieved from https://dl.acm.org/doi/pdf/10.1145/2696454.2696497

Salichs, M. A., Barber, R., Khamis, A. M., Malfaz, M., Gorostiza, J. F., Pacheco, R., ... & García, D. (2006, June). Maggie: A robotic platform for human-robot social interaction. In *2006 IEEE conference on robotics, automation and mechatronics* (pp. 1-7). IEEE. Retrieved from https://ieeexplore.ieee.org/abstract/document/4018870

Schinka, J. A., Kinder, B. N., & Kremer, T. (1997). Research validity scales for the NEO--PI--R: Development and initial validation. *Journal of Personality Assessment*, *68*(1), 127-138. Retrieved from https://www.tandfonline.com/doi/pdf/10.1207/s15327752jpa6801_10?casa_token=oXC2U1X8F2MAAAAA:ahMTjqkRGHpmsPSmmPGMuF_Bo6xjqd2n-mIAAxGEmF6NCaRPoUwd6StfJP7xfAGNxJBwl9fGnkr1RA

Schommer, E., Patel, V. R., Mouraviev, V., Thomas, C., & Thiel, D. D. (2017). Diffusion of robotic technology into urologic practice has led to improved resident physician robotic skills. *Journal of surgical education*, *74*(1), 55-60. Retrieved from https://www.sciencedirect.com/science/article/pii/S1931720416300757?casa_token=iWFzYMFiErAAAAAA:gHD6qPUe9q_4ERDEMzs6iqEZFLQXVobIouH5qut3QD_-_CpXDR6KFNQE36s4VwvL93o8e5WmRe0

Schretlen, D. J., van der Hulst, E. J., Pearlson, G. D., & Gordon, B. (2010). A neuropsychological study of personality: Trait openness in relation to intelligence, fluency, and executive functioning. *Journal of clinical and experimental neuropsychology*, *32*(10), 1068-1073. Retrieved from https://www.tandfonline.com/doi/full/10.1080/13803391003689770?casa_token=HFPLo5B9R34AAAAA:3X3AxmDEqN2TJmKZzhX7B0e_tXMLdaFfI44S_lUs12ppoy9cRKitvB5ZzETnNy3-QpdxNjga6BnaMA

Segars, A. H., & Grover, V. (1993). Re-examining perceived ease of use and usefulness: A confirmatory factor analysis. *MIS quarterly*, 517-525. Retrieved from https://www.jstor.org/stable/249590?seq=1

Seibert, S. E., & Kraimer, M. L. (2001). The five-factor model of personality and career success. *Journal of vocational behavior*, *58*(1), 1-21. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S0001879100917573

Setar , L., & MacFarland, M. (2012). Top 10 FastestGrowing Industries. *IBISWorld.* Retrieved from http://absolutevariety.com/wp-content/uploads/2012/04/Fastest-Growing-Industries.pdf

Shiraishi, J. C., Gadelha, A. B., Bezerra, L. M. A., & Porto, L. G. G. (2017). Effects of a 12-week systematized yoga intervention on health-related physical fitness in healthy adults. *Advances in Physical Education*, *7*(01), 27. Retrieved from https://www.scirp.org/html/3-1600317_74122.htm

Simon, M. (2018, August 8). Anki's New Home Robot, Vector, Sure Is Cute. But Can It Survive? Retrieved from https://www.wired.com/story/ankis-new-home-robot-sure-is-cute-but-can-it-survive/

Slaughter, J. E., & Kausel, E. E. (2009). The neurotic employee: Theoretical analysis of the influence of narrow facets of neuroticism on cognitive, social, and behavioral processes relevant to job performance. *Research in personnel and human resources management*, *28*, 265. Retrieved from https://www.emerald.com/insight/content/doi/10.1108/S0742-7301(2009)0000028010/full/html

Slovic, P., Fischhoff, B., & Lichtenstein, S. (1977). Behavioral decision theory. *Annual review of psychology*, *28*(1), 1-39. Retrieved from https://www.annualreviews.org/doi/pdf/10.1146/annurev.ps.28.020177.000245

Smith, A., & Anderson, J. (2014). AI, Robotics, and the Future of Jobs. *Pew Research Center*, *6*. Retrieved from http://www.fusbp.com/wp-content/uploads/2010/07/AI-and-Robotics-Impact-on-Future-Pew-Survey.pdf

Smith, T. W. (2006). Personality as risk and resilience in physical health. *Current directions in psychological science*, *15*(5), 227-231. Retrieved from https://journals.sagepub.com/doi/pdf/10.1111/j.1467-8721.2006.00441.x?casa_token=MzEJ0kHXhjgAAAAA:7oAR6Nzjba-hJoR-GoWy6YdTYSYthjrr76OUYehGkuqEOYPktYxp4TpJbsmH-bFfVboge7gY5jL8bg

SoftBank Robotics. (n.d.). *Pepper* Retrieved from https://www.softbankrobotics.com/emea/en/pepper

Soldz, S., & Vaillant, G. E. (1999). The Big Five personality traits and the life course: A 45-year longitudinal study. *Journal of Research in Personality*, *33*(2), 208-232. Retrieved from https://pdfs.semanticscholar.org/88db/e1bf670333d79cb200f91605af6316d05884.pdf

Spencer, S. (2019, June 13). Beer yoga integrates mind, body, community at microbreweries. *AP News.* Retrieved from https://apnews.com/27623fbd866e456f960b7a242d60d6b8

Stoel, L., & Lee, K. H. (2003). Modeling the effect of experience on student acceptance of web-based courseware. *Internet Research*. Retrieved from https://www.emerald.com/insight/content/doi/10.1108/10662240310501649/full/html?casa_token=5Q-2894-bCUAAAAA:BBY5PwAVXyT-6zkF-IYjZvIMF96PTlbff5I6YUtVShji1aMSMsCk9Mj9sLi-wcjrffRjoYKuksgv_noQZ7vRXJgWlUnEsLyEUt9B2p3a1WsYCbAyHINf

Sundholm, M., Cheng, J., Zhou, B., Sethi, A., & Lukowicz, P. (2014, September). Smart-mat: Recognizing and counting gym exercises with low-cost resistive pressure sensing matrix. In *Proceedings of the 2014 ACM international joint conference on pervasive and ubiquitous computing* (pp. 373-382). Retrieved from https://dl.acm.org/doi/pdf/10.1145/2632048.2636088

Svendsen, G. B., Johnsen, J. A. K., Almås-Sørensen, L., & Vittersø, J. (2013). Personality and technology acceptance: the influence of personality factors on the core constructs of the Technology Acceptance Model. *Behaviour & Information Technology*, *32*(4), 323-334. Retrieved from https://www.tandfonline.com/doi/abs/10.1080/0144929X.2011.553740

Swatman, R. (2016, 21 April). Video: Watch 540 robots perform flawless record-breaking dance routine for Chinese TV show. *Guinness World Records.* Retrieved from https://www.guinnessworldrecords.com/news/brand-or-agency/2016/4/video-watch-540-robots-perform-flawless-record-breaking-dance-routine-for-chines-425903?fb_comment_id=946264922158464_1015351198583169

Szollosy, M. (2017). Freud, Frankenstein and our fear of robots: projection in our cultural perception of technology. *AI & SOCIETY*, *32*(3), 433-439. Retrieved from https://link.springer.com/article/10.1007/s00146-016-0654-7

Taimni, I. K. (1961). *The science of yoga*. Quest Books. Retrieved from https://www.yogastudies.org/wp-content/uploads/Science_of_Yoga-Taimni.pdf?fbclid=IwAR1IKtrt-HDPolghKQfJV321BjMujIzwvQ53oKicFJAZ0cKeZbDCIZCbr0c

Taneja, D. K. (2014). Yoga and health. *Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine*, *39*(2), 68. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4067931/

Tarantola, A. (2020, February 19). Sony Aibo review: Just get a puppy. Retrieved from https://www.engadget.com/2019-02-27-sony-aibo-review-just-get-a-puppy.html?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAABE0aGsG6O8oMM-i-Q280Nm0HRKwju1ayESreg97blFPFRbGIXSUWpRfkxNJRaPENokqupkkoWs83JoQ86SK_GkZ10tmL_9eZUP4jAGnhe1YrjlUKVb17ibWPBrwMkDBx0BIcmzSGDRO8CP5hyCj90NsZ7Gp4vTzChHkKSby6mSz

Teo, T. (2010). A path analysis of pre-service teachers' attitudes to computer use: applying and extending the technology acceptance model in an educational context. *Interactive Learning Environments*, *18*(1), 65-79. Retrieved from https://www.tandfonline.com/doi/full/10.1080/10494820802231327?casa_token=PbWo1bCsqHgAAAAA:SZnJUEngd1ifOj1u6sKFPCu6tzC42mewT_yIIEF517SDhsoywiFeziwTC9WqhyHG2Q-tNkkk_hR0_w

Terzis, V., Moridis, C. N., & Economides, A. A. (2012). How student's personality traits affect Computer Based Assessment Acceptance: Integrating BFI with CBAAM. *Computers in Human Behavior*, *28*(5), 1985-1996. Retrieved from https://www.sciencedirect.com/science/article/pii/S0747563212001471?casa_token=VtP9gj10nScAAAAA:ELJnrsi6vtFzr3LAOJYprONueEO8kmgHRv35pRZbtb74aU1Mnm95Kc1aBsr5nautYxc5yCz8AXs

Thames, L., & Schaefer, D. (2016). Software-defined cloud manufacturing for industry 4.0. *Procedia cirp*, *52*, 12-17. Retrieved from https://doi.org/10.1016/j.procir.2016.07.041

Thornhill, A., Saunders, M., & Lewis, P. (2009). *Research methods for business students*. Prentice Hall: London.

Tussyadiah, I. P., Zach, F. J., & Wang, J. (2020). Do travelers trust intelligent service robots?. *Annals of Tourism Research*, *81*(C). Retrieved from https://www.tussyadiah.com/Do%20we%20trust%20robots_TussyadiahZachWang_Final.pdf

UBTECH Robotics. (2017) *Alpha 1 and Meebot welcome Manchester City squad during the guard of honour!*. YouTube. https://www.youtube.com/watch?v=TKfWyEHfzOg

UBTECH Robotics. (2017) *Celebrate with Man City players and Alpha 1 Pro.* YouTube. https://www.youtube.com/watch?v=8ObiGq6Ytus

UBTECH Robotics. (2017) *Man City Stars Play Soccer w/ Alpha 1S Robots.* YouTube. https://www.youtube.com/watch?v=sI7kRrYv82A

UBTECH. (2018, January 9). *UBTECH Announces Walker the World's First Bipedal Intelligent Humanoid Robot for Consumers* [Press release]. Retrieved from https://pressroom.ubtrobot.com/2018/01/09/ubtech-announces-walker-the-worlds-first-bipedal-intelligent-humanoid-robot-for-consumers/

UBTECH. (2020) *Alpha 1P FAQ*. Retrieved from https://ubtrobot.com/pages/alpha-1p-faq?ls=en

UBTECH. (2020) *Alpha Robot Downloads.* Retrieved from https://www.ubtrobot.com/products/alpha-1p?ls=en

UBTECH. (2020) *INNOVATION AT UBTECH.* Retrieved from https://www.ubtrobot.com/collections/innovation-at-ubtech?ls=en

UBTECH. (2020) *Products: Alpha 1 Pro.* Retrieved from https://www.ubtrobot.com/products/alpha-1p?ls=en

UBTECH. (2020, January 3). *The Future of Robotics Takes Center Stage with UBTECH at CES 2020* [Press release]. Retrieved from https://pressroom.ubtrobot.com/2020/01/03/the-future-of-robotics-takes-center-stage-with-ubtech-at-ces-2020/

Van der Heijden, H. (2004). User acceptance of hedonic information systems. *MIS quarterly*, 695-704. Retrieved from https://www.jstor.org/stable/25148660?seq=1

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management science*, *46*(2), 186-204. Retrieved from https://pubsonline.informs.org/doi/pdf/10.1287/mnsc.46.2.186.11926?casa_token=_rMm_Gr9-cQAAAAA:KVJcWhrCTbyP8C6r9AFvmllq3bfaFCbbIg-Qb5jQqIvwV4wJKta_gS-nXnMmOo1-QEBRvccEETnj

Venkatesh, V., & Morris, M. G. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior. *MIS quarterly*, 115-139. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.361.4468&rep=rep1&type=pdf

Verma, P., & Sinha, N. (2018). Integrating perceived economic wellbeing to technology acceptance model: The case of mobile based agricultural extension service. *Technological forecasting and social change*, *126*, 207-216. Retrieved from https://www.sciencedirect.com/science/article/pii/S0040162516303316?casa_token=h7wziF_5arUAAAAA:UJpeiiDv10HqgxYnAmbD1mBR4GNhDZOGvsAjpNQZpYw9ICW99FS5iDeJgopqCxFIG7AlFEFBCKY

Violato, C., & Hecker, K. G. (2007). How to use structural equation modeling in medical education research: A brief guide. *Teaching and learning in medicine*, *19*(4), 362-371. Retrieved from https://www.tandfonline.com/doi/full/10.1080/10401330701542685?casa_token=gPdw_NykYecAAAAA:NIX7calCArP1lH3QjJCykz2WVBQLk8hk3NrZZU4_4SrQ7bDMzxfR11kBlumJsXVEnaweAZJeEW6OQQ

Von der Putten, A.M., Krämer, N. C., & Gratch, J. (2010, September). How our personality shapes our interactions with virtual characters-implications for research and development. In *International Conference on Intelligent Virtual Agents* (pp. 208-221). Springer, Berlin, Heidelberg. Retrieved from https://www.researchgate.net/profile/Astrid_Marieke_Rosenthal-

von_der_Puetten/publication/221588444_Lecture_Notes_in_Computer_Science/links/54fef5130cf2672e2240e42b/Lecture-Notes-in-Computer-Science.pdf

Wainer, J., Feil-Seifer, D. J., Shell, D. A., & Mataric, M. J. (2007, August). Embodiment and human-robot interaction: A task-based perspective. In *RO-MAN 2007-The 16th IEEE International Symposium on Robot and Human Interactive Communication* (pp. 872-877). IEEE. Retrieved from https://ieeexplore.ieee.org/abstract/document/4415207/

Walters, M. L., Koay, K. L., Syrdal, D. S., Dautenhahn, K., & Te Boekhorst, R. (2009). Preferences and perceptions of robot appearance and embodiment in human-robot interaction trials. *Procs of New Frontiers in Human-Robot Interaction*. Retrieved from https://uhra.herts.ac.uk/bitstream/handle/2299/9642/903516.pdf?sequence=1&isAllowed=y

Walters, M. L., Syrdal, D. S., Dautenhahn, K., Te Boekhorst, R., & Koay, K. L. (2008). Avoiding the uncanny valley: robot appearance, personality and consistency of behavior in an attention-seeking home scenario for a robot companion. *Autonomous Robots*, *24*(2), 159-178. Retrieved from https://link.springer.com/article/10.1007/s10514-007-9058-3

Woods, S., Dautenhahn, K., & Schulz, J. (2004, September). The design space of robots: Investigating children's views. In *RO-MAN 2004. 13th IEEE International Workshop on Robot and Human Interactive Communication (IEEE Catalog No. 04TH8759)* (pp. 47-52). IEEE. Retrieved from https://uhra.herts.ac.uk/bitstream/handle/2299/1895/902082.pdf?sequence=1&isAllowed=n

Wu, J. H., & Wang, S. C. (2005). What drives mobile commerce?: An empirical evaluation of the revised technology acceptance model. *Information & management*, *42*(5), 719-729. Retrieved from https://www.sciencedirect.com/science/article/pii/S0378720604000904?casa_token=XP0aU2rtx44AAAAA:0o1ZMyeW67ExR8mM2qDr9xBlL0gpUfcIA0DtaUuw-onAtVV5rAzefUsfI1t1cPChd6vELkMyu_o

Yih, M. B., & Nah, E. A. (2009, January). Measuring students' perception of writing web logs in ESL classroom employing the Technology Acceptance Model. In *Conference on scientific and Social research* (pp. 1-9). Retrieved from https://www.researchgate.net/profile/Dr_Mah_Boon_Yih/publication/234113541_Measuring_Students'_Perception_of_Writing_Web_Logs_in_ESL_Classroom_Employing_the_Technology_Acceptance_Model/links/5902fd7f0f7e9bcf65493510/Measuring-Students-Perception-of-Writing-Web-Logs-in-ESL-Classroom-Employing-the-Technology-Acceptance-Model.pdf

Young, M. S., & Schinka, J. A. (2001). Research validity scales for the NEO-PI-R: Additional evidence for reliability and validity. *Journal of Personality Assessment*, *76*(3), 412-420. Retrieved from https://www.tandfonline.com/doi/pdf/10.1207/S15327752JPA7603_04?casa_token=zcrawPtCC48AAAAA:oc7Tfn7gNtuYNsX8yuXAYlj5v0u9vrq4tm4iTFCZdbm8PNYR1GKk83HGTEGGFRi2RPKRM9bG8_nkdw

Zhang, S., Zhao, J., & Tan, W. (2008). Extending TAM for online learning systems: An intrinsic motivation perspective. *Tsinghua Science and Technology*, *13*(3), 312-317. Retrieved from https://ieeexplore.ieee.org/abstract/document/6071886

Zhou, K. (2016). Non-cognitive skills: definitions, measurement and malleability. *Background paper prepared for the 2016 Global Education Monitoring Report to UNESCO*. – Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000245576

Zhou, T., & Lu, Y. (2011). The effects of personality traits on user acceptance of mobile commerce. *Intl. Journal of Human–Computer Interaction*, *27*(6), 545-561. Retrieved from https://www.tandfonline.com/doi/abs/10.1080/10447318.2011.555298