# “Alexa, Let’s Talk About my Productivity”: The Impact of Digital Assistants on Work Productivity

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**Abstract**

The Coronavirus (COVID-19) pandemic has significantly reshaped work patterns and the environment, forcing organisations to adopt remote working where possible. The shift of work patterns has accelerated digitalisation and inspired innovative uses of technology to accommodate the new work style and living conditions. Working from home meant that applications and services typically found in home settings but not in office ones, such as digital assistants based on artificial intelligence (AI), could be utilised. Given the embeddedness of digital assistants in individuals’ life and the likely long-term role of remote work in the future, this study pursued two objectives. First, it aimed to explore the factors conducive to the use of AI, which can lead to satisfaction with the use of technology. Secondly, it aimed to examine the impact of individuals’ satisfaction on individuals’ productivity and job engagement. The study employed a survey research design to collect 536 responses from individuals who used digital assistants for work purposes. Using structural equation modelling, the study tested the correlation of two groups of factors: the beliefs about technology utilisation and digital assistants, with satisfaction. Then, we explored the relationship between satisfaction and work-related outcomes. Path analysis showed that performance expectancy, perceived enjoyment, intelligence, social presence and trust determine satisfaction with digital assistants. The results also confirmed that satisfaction is strongly related to productivity and job engagement. The findings of this paper contribute to the literature focusing on the use of digital assistants and the research on using artificial intelligence related to supporting and complementing work tasks. Also, the findings provide practical implications by informing developers about the features of the technology that would help realise the promised benefits of such assistants.

Keywords: Digital assistant, artificial intelligence, digitalisation, satisfaction, job engagement, productivity

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# 1. Introduction

A voice-based digital assistant (VBDA) is an AI-powered technology and can refer to a stand-alone device, such as Alexa, Facebook or Google Home, as well as a voice-controlled application embedded in smart technology (e.g. mobile phones, personal computers, watches, TV), such as Siri and Cortana (Liao et al., 2019, Balakrishnan and Dwivedi, 2021, Moriuchi, 2019, Pantano and Pizzi, 2020). The uniqueness of digital assistants enabled by AI is human-like features supporting voice conversation with their users, and constantly evolving intelligence, leading to service improvements based on past interactions with users (Pantano and Pizzi, 2020, McLean and Osei-Frimpong, 2019). The intuitive interface, voice control and intelligent capabilities of AI-based technology have made it widely appealing for the general public. People seek to enjoy an unprecedented level of experience personalisation and the efficiency of tasks, such as grocery ordering, booking, appointment scheduling, digital content retrieval and management (McLean and Osei-Frimpong, 2019). Due to the capabilities of digital assistants, they are projected to overshadow the value of other smart devices and see an adoption growth of 1000% by 2023 (Smith, 2019, McLean and Osei-Frimpong, 2019). While this growth is mostly expected to contribute to the development of voice-commerce (Smith, 2019), the applications of the technology could potentially be much wider than are now imagined. It is important to consider the use of digital assistants beyond the private context in light of the impact of the Coronavirus (COVID-19) pandemic, which made people rethink the overall implications of digital technologies (Papagiannidis et al., 2020a). With the introduction of local and national lockdowns and social distancing rules, many organisations were forced to shift to the work-from-home pattern to ensure business continuity (Barnes, 2020, Carroll and Conboy, 2020, Papagiannidis et al., 2020b). This new reality encouraged the use of information and communication technologies to support remote working. Given the availability of digital assistants in smart home settings (Marikyan et al., 2019), working from home meant that digital assistants could also be used for work-related tasks, such as arranging calls, meetings, retrieving information and other activities. Such a potential spillover application of voice-controlled digital assistants requires an empirical insight into the determinants and the outcomes of the use of AI-based technology for work purposes.

The current literature on the applications of AI in the work context lacks evidence about the complementary role and implications of technology in supporting workers' activities. Firstly, the majority of scholarly works are characterised by an interest in and concern with the capabilities of AI technology, which can replace manual processes and the human workforce. The applications include the automation of manual assembly lines in manufacturing (Katz and Margo, 2014, Li et al., 2017, Nikolic et al., 2017), delivering care in the medical sector (Hamet and Tremblay, 2017), and data management and visualisation (Dwivedi et al., 2019, Olshannikova et al., 2015, Zhong et al., 2017). The research on AI-based digital assistants that could potentially complement work-related tasks predominantly focuses on the use of technology in an e-commerce scenario (Rzepka et al., 2020, Balakrishnan and Dwivedi, 2021). Such studies examined technology adoption factors (Yen and Chiang, 2020, Fernandes and Oliveira, 2021, Moriuchi, 2019) and the underpinnings of purchasing behaviour (Canziani and MacSween, 2021, Balakrishnan and Dwivedi, 2021). Hence, little is known about individuals' utilisation of the technology that is not designed to automate work practices, but rather support them in carrying out tasks. Secondly, considering the lack of research on the applications of AI-based technology complementing work-related tasks, there is a gap in the understanding of the impacts of such technology on workers' performance and benefits for organisations. Researchers mainly discuss the benefits of automation in organisations (Balakrishnan and Dwivedi, 2021, Chattaraman et al., 2019, Fernandes and Oliveira, 2021) or the ethical concerns entailed by machines' control over employees and humans being replaced (Kane et al., 2021, La Torre

et al., 2021). This means that the impacts of the implications of AI-based technology in terms of satisfaction and work-related outcomes have not been explored. Such evidence is important to understand the role of technology and the conditions of its use, which can facilitate employees' performance.

To address the above research gaps the objective of the study is two-fold. The first objective is to explore the factors conducive to the utilisation of digital assistants for work purposes. The paper studies the factors related to satisfaction with the utilisation of digital assistants through a review of the published evidence and the validation of results using a conceptual pilot study. Such an approach helps improve the explanatory nature of the research model by ensuring the relevance of the identified constructs and the inclusion of the factors that may not feature in the literature. The second objective of the paper is to explore the work-related outcomes of the use of digital assistants. Specifically, the paper conceptualises and examines the correlation between use satisfaction, job engagement and productivity.

The study is structured as follows. First, the literature review section provides the findings of research studies on voice-based digital assistants, which helps develop a research model. The hypothesis development section provides the justifications for the proposed relationships. The methodology section explains the steps taken to conduct the research. This is followed by the results and the discussion sections. The paper concludes with a presentation of the theoretical and practical contributions, limitations and future research avenues.

## 2. Literature review

### 2.1. Artificial Intelligence at Work

Over the past few years, applications of AI-based technology by companies have increased exponentially (La Torre et al., 2021, Balakrishnan and Dwivedi, 2021, Dwivedi et al., 2019). The integration of AI adds enhanced human-like cognitive abilities to machines, such as the automation of manual processes, visual recognition, problem-solving and decision-making (Benbya et al., 2020). AI-powered systems can be represented by applications delivering enhanced capabilities, such as chatbots and virtual intelligent interfaces, robotic equipment and other digital assisting devices (Balakrishnan and Dwivedi, 2021, Chattaraman et al., 2019, Fernandes and Oliveira, 2021). On the one hand, AI technology can improve individuals' efficiency by automating the human element of the workload, which makes the technology useful in sectors such as education, healthcare, management and manufacturing (Dirican, 2015, Dwivedi et al., 2019, Hamet and Tremblay, 2017). For instance, the AI-based information management application can replace a traditional record-keeping system, enabling medical workers to sort and control patients' records, analyse data and take informed decisions. Robotic devices can be used to assist in operations, take care of elderly patients and manage drug therapy (Hamet and Tremblay, 2017). In the manufacturing sector, the adoption of AI technology can automate production and improve the throughput (Katz and Margo, 2014, Li et al., 2017, Nikolic et al., 2017). When it comes to data management, the use of AI can enhance company performance and simplify the decision-making procedures, as the technology can efficiently analyse and visualise complex data (Dwivedi et al., 2019, Olshannikova et al., 2015, Zhong et al., 2017). The accelerated information processing capabilities of AI technology overcome human cognitive constraints (Young et al., 2021). The increased reliance on the non-human workforce, though, raises concerns in relation to ethical and moral implications (Kane et al., 2021). Moreover, the introduction of intelligent systems

entails greater control and complexity, thus accelerating human resistance to leveraging such technology at work (La Torre et al., 2021).

On the other hand, AI systems, such as voice-based digital assistants, can offer a supportive role for their users (Balakrishnan and Dwivedi, 2021). Digital assistants employ Natural Language Processing (NLP) to interact with individuals (Pantano and Pizzi, 2020, Taulli, 2019) and help them accomplish a variety of tasks through retrieving requested data from the internet, processing online transactions and communicating news among other services (Chattaraman et al., 2019). Also, digital assistants can provide emotional support for their users (Gelbrich et al., 2021), which is critical for employees' wellbeing. Such technology can deliver complementary services for people in the work context, as opposed to fully replacing the human workforce or transforming existing work processes. However, despite the theoretical advantages of the technology for work purposes, researchers so far have not empirically explored the impacts of the use of digital assistants for workers and organisations.

The main body of the published research on the use of digital assistants refers to their application in voice-commerce. Scholars have explored the factors of adoption and privacy concerns. The studies on the adoption of voice-based digital assistants investigated general technology acceptance factors and specific factors related to digital assistants as the antecedents of use intention and behaviour (Fernandes and Oliveira, 2021, Ashfaq et al., 2020, Balakrishnan and Dwivedi, 2021, Vimalkumar et al., 2021). The majority of published studies have examined the utilisation of the devices in the context of voice commerce, aiming to explain individuals' intention to place orders using voice commands (Balakrishnan and Dwivedi, 2021, Canziani and MacSween, 2021, Rzepka et al., 2020, Yen and Chiang, 2020). They explored the role of external factors, perceived beliefs about technology utilisation and perceived benefits (Rzepka et al., 2020, Vimalkumar et al., 2021, Fernandes and Oliveira, 2021). Also, for motivating users, it is important that voice-based digital assistants can ensure hedonic benefits (Rzepka et al., 2020). Hedonic benefits refer to the perceived fun or enjoyment of operating technology (Vallerand, 1997, Venkatesh et al., 2012).

When it comes to specific factors related to voice-based digital assistants, scholars have argued that the perception that the technology is lifelike drives its adoption. The factors associated with this perception include human-like characteristics of digital assistants, technology intelligence, feeling social presence and social interaction (Balakrishnan and Dwivedi, 2021, Yen and Chiang, 2020, Fernandes and Oliveira, 2021, Wagner et al., 2019). Despite the conceptual discourse about the role of the factors in the adoption of the technology, empirical examination confirmed that their effects are not always significant (Balakrishnan and Dwivedi, 2021, Fernandes and Oliveira, 2021). This indicates that individuals do not always associate digital assistants with human beings. While users can humanise devices at the beginning, the attitude towards them can change after a period of device utilisation (Hu et al., 2021).

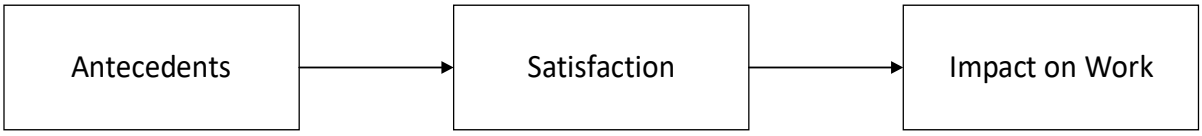
To provide tailored services and increase individuals' effectiveness, voice-based digital assistants collect a vast amount of personal data (Gardiner, 2018, Wollerton, 2019). Given the embeddedness of digital assistants in everyday life, the collection of personal data can raise privacy issues. Therefore, the broad scope of the digital assistant literature concerns individuals' perceived security and privacy risks when interacting with the technology (Liao et al., 2019, Vimalkumar et al., 2021, Chung et al., 2017, Hasan et al., 2021, Foehr and Germelmann, 2020). Scholars have discussed the potential of privacy and security concerns in relation to the use of digital assistants (Chung et al., 2017, Hasan et al., 2021, Vimalkumar et al., 2021), although empirical research does not provide consistent evidence (Vimalkumar et al., 2021, Yen and Chiang, 2020, Liao et al., 2019).

Given the potential implications of technology beyond the private context and the growing digitalisation of work practices incurred by the shift to working from home, this paper explores the use of digital assistants for work purposes. The following section will discuss the conceptual model and the theoretical justification for the hypotheses.

## 3. Hypothesis development

This paper focuses on the implications of the use of digital assistants for work-related tasks by exploring the determinants and the outcomes of satisfaction with digital assistants (Figure 1). A positive affective state resulting from the use of the technology can be associated with two groups of factors – the beliefs about technology utilisation and digital assistant-specific factors. The beliefs about technology utilisation (e.g. effort expectancy, performance expectancy) have been widely investigated and validated as the core constructs determining technology acceptance (Moriuchi, 2021, Buabeng-Andoh and Baah, 2020, Owusu Kwateng et al., 2018, Thongsri et al., 2018, Abbas et al., 2018, Tarhini et al., 2016). The theorisation of the role of the second group of factors is drawn from the research on digital assistants, which explores the characteristics of the technology affecting the experience of their use (Fernandes and Oliveira, 2021, Wagner et al., 2019, Qiu and Benbasat, 2009, Balakrishnan and Dwivedi, 2021, Moussawi et al., 2020). The outcomes of satisfaction concern job engagement and productivity, as highlighted by the research on the application of information systems in organisations (Liu et al., 2017, Passalacqua et al., 2020, Hammedi et al., 2021, Fuller and Dennis, 2009). The rationale for hypothesising each factor is provided in the sections following.

**Figure 1: Overview of the conceptual model**




### 3.1. The Antecedents of Satisfaction

Beliefs about technology utilisation include factors such as performance expectancy, effort expectancy and perceived enjoyment. Performance expectancy and effort expectancy are the pillars of the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003). UTAUT proved to be an influential theoretical model to explain technology adoption for various technology applications (Williams et al., 2015, Venkatesh et al., 2016). The model has been applied to investigate the adoption of smart technologies, mobile technologies, e-government, e-health and virtual reality (Moriuchi, 2021, Buabeng-Andoh and Baah, 2020, Owusu Kwateng et al., 2018, Thongsri et al., 2018, Abbas et al., 2018, Tarhini et al., 2016). Performance expectancy is defined as *"the degree to which an individual believes that using the system will help him or her to attain gains in job performance"* (Venkatesh et al., 2003). In the context of this study, performance expectancy refers to an individual's belief that the use of voice-based digital assistants improves their job performance. In the technology utilisation research, it is well established that performance expectancy facilitates technology adoption (Jadil et al., 2021, Rey-Moreno et al., 2018). On the one hand, the belief can predict the initial use of technology. For example, it has been shown that that users tend to use e-government systems when they perceive them to be useful (Rey-Moreno et al., 2018). On the other hand, perceived usefulness of technology after actual trial can determine its continuous use (Rey-Moreno et al., 2018). Also, it

can indirectly affect the feeling of loyalty through enhanced attitude (Moriuchi, 2019). Projects examining the use of digital assistants reported that when individuals perceive the usefulness of devices for their tasks, they tend to adopt them and experience satisfaction (Vimalkumar et al., 2021, Ashfaq et al., 2020). Effort expectancy is defined as *"the degree of ease associated with the use of the system"* (Venkatesh et al., 2003). In the context of voice-based digital assistant applications, effort expectancy refers to individuals' belief as to how easy it is for them to operate the technology. There is evidence that the simplicity of e-health mobile applications contributes to the intention to adopt them (Seethamraju et al., 2018). Also, perceived ease of use can indirectly affect adoption. For example, the deployment of smart home technologies is determined by the perception as to whether the use of smart devices will be effortless, which, in turn, enhances the perception of the usefulness of the technology (Marikyan et al., 2021). In the context of voice-based digital assistants, the effect of effort expectancy is inconsistent (Balakrishnan and Dwivedi, 2021, Vimalkumar et al., 2021, Fernandes and Oliveira, 2021), which can be attributed to differences in samples, the technical infrastructure of countries or culture. Perceived enjoyment is defined as *"the extent to which the activity of using the computer is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated"* (Davis et al., 1992). When it comes to voice-based digital assistants, perceived enjoyment captures individuals' perception of whether their use for work purposes is enjoyable and fun. Perceived enjoyment is an intrinsic motivation driving behaviour (Balog and Pribeanu, 2010). Similarly, in the information systems literature, the relationship between perceived enjoyment and behavioural intention is theoretically justified. The role of intrinsic motivation derives from evidence suggesting a link between enjoyable use experience and individuals' behavioural intention to use technology again (Davis et al., 1992). This relationship has found wide support in the literature (Sun and Zhang, 2006, Balog and Pribeanu, 2010, Van der Heijden, 2004, Ashfaq et al., 2020, Holdack et al., 2020). It has been reported that perceived enjoyment has both direct and indirect effects on individuals' satisfaction and behaviour (Balog and Pribeanu, 2010, Van der Heijden, 2004, Ashfaq et al., 2020). For instance, when the use of websites is emotionally appealing, people tend to return to them later (Van der Heijden, 2004). The research on the adoption of augmented reality systems found that the use of the technology is motivated by the feeling of enjoyment, mediated by perceived usefulness (Balog and Pribeanu, 2010) and a positive attitude (Holdack et al., 2020). Also, when interaction with chatbots is pleasant they tend to develop satisfaction with the use of the system (Ashfaq et al., 2020). Given the evidence in the literature, we hypothesise:

*Hypothesis 1: There is a positive relationship between performance expectancy and satisfaction with voice-based digital assistants.*

*Hypothesis 2: There is a positive relationship between effort expectancy and satisfaction with voice-based digital assistants.*

*Hypothesis 3: There is a positive relationship between perceived enjoyment and satisfaction with voice-based digital assistants.*

Based on the synthesis of the literature on digital assistants, the specific factors related to the use of devices include perceived anthropomorphism, perceived intelligence, social presence and trust in technology (Moussawi et al., 2020, Balakrishnan and Dwivedi, 2021, Fernandes and Oliveira, 2021, Arfi et al., 2021). Perceived anthropomorphism concerns individuals' perception of how close a device is to a human being (Qiu and Benbasat, 2009). This perception arises when individuals assign human characteristics, behaviour, attributes or emotions to objects or to non-human agents (Qiu and Benbasat, 2009, Pfeuffer et al., 2019). Technology design, which includes human-like characteristics, refers to an anthropomorphic design (Qiu and Benbasat, 2009). There are many examples of technology that contains anthropomorphic designs, such as chatbots, robots and virtual agents

(Ashfaq et al., 2020, Duffy, 2003, Han, 2020, Baylor, 2009). It has been reported that when individuals recognise anthropomorphic cues in technology, they perceive the technology differently (Qiu and Benbasat, 2009, Pfeuffer et al., 2019). This characteristic has resulted in anthropomorphism been widely researched, when examining human-technology interaction (Złotowski et al., 2015, Duffy, 2003, Murphy et al., 2019, Riek et al., 2009). Scholars have postulated that perceived anthropomorphism has a direct and an indirect effect on behavioural intention and the adoption of voice-based digital assistants. For instance, individuals who consider personal intelligent agents to have a human-like nature experience enjoyment from their use (Moussawi et al., 2020), increased need for interaction (Sheehan et al., 2020) and a positive attitude towards devices (Balakrishnan and Dwivedi, 2021). This means that the capability of voice-based digital assistants to respond to and support conversations makes them resemble human beings, which can motivate their adoption. Following the evidence in the literature we propose:

*Hypothesis 4: There is a positive relationship between perceived anthropomorphism and satisfaction with voice-based digital assistants.*

The concept of system intelligence is not new in technology management research. It was introduced to characterise a system that is able to aid humans in solving complex tasks (McCarthy and Hayes, 1981, Russell and Norvig, 2002). With the development of intelligent agents, system intelligence has been contextualised to reflect the characteristics of the new system. When it comes to intelligent agents, perceived intelligence is defined as *"individuals' perception that the personal intelligent agent's behaviour is efficient and autonomous with the ability to process and produce natural language and deliver effectual output"* (Moussawi and Koufaris, 2019). In the context of this research, perceived intelligence refers to the belief that voice-based digital assistants are capable of completing the required tasks for work purposes. The literature provides empirical support suggesting that perceived intelligence motivates behaviour by forming a positive attitude or stimulating behavioural intention (Tan and Liew, 2020, Balakrishnan and Dwivedi, 2021). For example, in e-commerce, the belief in system intelligence increases purchases (Tan and Liew, 2020). Similarly, in the voice-commerce context, a positive assessment of the intelligent capabilities of digital assistants improves the attitude towards them and the intention to complete a purchase (Balakrishnan and Dwivedi, 2021). Perceived intelligence is associated with perceived anthropomorphism. Individuals tend to assign human-like characteristics to devices that they find to be intelligent (Moussawi et al., 2020). Also, evidence from prior research suggests that the stronger the perception of system intelligence, the stronger the belief that the technology can be more effective and useful in delivering the required services (Moussawi et al., 2020). Hence, it is assumed that the intelligence of digital assistants can help in delivering work-related tasks, thus positively contributing to satisfaction.

Hypothesis 5: *There is a positive relationship between perceived intelligence and satisfaction with voice-based digital assistants.*

In the context of the use of voice-based digital assistants, perceived social presence refers to the degree to which an individual feels the presence of the technology. Due to advances in technology (e.g. robotics), individuals may develop a deeper connection with devices, which could form a positive perception and drive use behaviour (Fernandes and Oliveira, 2021, Wagner et al., 2019, Qiu and Benbasat, 2009). Scholars have empirically confirmed that perceived social presence has both a direct and an indirect effect on technology use (Wagner et al., 2019, Fernandes and Oliveira, 2021, Qiu and Benbasat, 2009). When individuals perceive social presence while interacting with the device, they tend to like it more and have a stronger perception of being engaged in social interaction, which triggers intention to use it (Wagner et al., 2019, Fernandes and Oliveira, 2021). Also, perceived social presence can be a direct predictor of technology acceptance (Fernandes and Oliveira, 2021).

Language-based communication enhances the feeling of social presence, increasing engagement with the technology, which enables users to complete the required tasks effectively (Chattaraman et al., 2019, Fernandes and Oliveira, 2021). Given the prior evidence, we hypothesise that:

Hypothesis 6: *There is a positive relationship between perceived social presence and satisfaction with voice-based digital assistants.*

Trust is a critical factor when exploring technology adoption (Gefen et al., 2003a, Patil et al., 2020, Arfi et al., 2021). For example, individuals develop the behavioural intention to shop online when they trust the vendor (Gefen et al., 2003b). It has been shown that trust is the strongest predictor of individuals' attitude towards mobile payments (Patil et al., 2020). Similarly, when it comes to the adoption of AI-driven technology, such as voice assistants, trust plays a crucial role (Fernandes and Oliveira, 2021, Vimalkumar et al., 2021, Yen and Chiang, 2020, Liao et al., 2019, Qiu and Benbasat, 2009). Prior literature showed that trust in digital assistants has both direct and indirect effects on individuals' behaviour (Vimalkumar et al., 2021, Fernandes and Oliveira, 2021). For instance, trust can affect behavioural intention through enhanced performance expectancy (Vimalkumar et al., 2021). When it comes to direct effects, trust in chatbots on shopping websites results in intention to complete a purchase (Yen and Chiang, 2020), while trust in digital assistants stimulates the intention to use them (Fernandes and Oliveira, 2021, Vimalkumar et al., 2021). Given the theoretical and empirical evidence in the literature, we hypothesise that:

Hypothesis 7: *There is a positive relationship between trust in voice-based digital assistants and satisfaction with voice-based digital assistants.*

### 3.2. The Outcomes of Satisfaction

This study proposes a relationship between satisfaction with voice-based digital assistants, job engagement and productivity. The rationale for assuming a correlation between the factors is drawn from the research on information system management (Liu et al., 2017, Passalacqua et al., 2020, Hammedi et al., 2021, Fuller and Dennis, 2009). The use of technology for performance enhancement has long been the subject of inquiry in academic literature (Lin, 2012, Goodhue and Thompson, 1995, Fuller and Dennis, 2009, Passalacqua et al., 2020, Hammedi et al., 2021). One stream in the information system adoption research aimed to examine the functionality and the services of technology that facilitate the implementation of tasks, positively contributing to individuals' performance (Lin, 2012, Goodhue and Thompson, 1995, Fuller and Dennis, 2009). For instance, the use of technology that fits job requirements improves individuals' performance (Teo and Men, 2008, Fuller and Dennis, 2009). The functionality of voice-based assistants can meet the needs of users in managing work-related activities, such as arranging calls, appointments and reminders. Hence, this functionality can improve individuals' efficiency and their job outcomes respectively. Against the backdrop of technology development, the focus of the research has been switched from utility-oriented technology to systems providing entertaining experiences, such as mobile technology, virtual reality and virtual engagement platforms (Liu et al., 2017, Passalacqua et al., 2020, Hammedi et al., 2021). This stream of research explored not only technological functional attributes aimed at catering to the needs of users, but the hedonic aspect of technology use, which can positively impact post-adoption behaviour. For example, scholars found that the inclusion of entertaining elements in the warehouse management system in the logistics sector can result in the improved performance and engagement of warehouse employees (Passalacqua et al., 2020). Similarly, using such a system for human resources management can drive satisfaction and higher engagement at work (Silic et al.,

2020). Although the use of technologies to create entertaining work experiences decreases work engagement, this effect is moderated by employees' willingness to participate in the technology-facilitated work (Hammedi et al., 2021). On the other hand, it has also been shown that use intention is a condition that ensures a positive effect of use experience. A higher intention to interact with technology explains the frequency of technology use and use patterns, influencing engagement (Kim and Ausar, 2018). Given that the use of digital assistants is a voluntary choice, the interaction with the technology can bring satisfactory experiences, improve individuals' engagement and have a positive impact on their productivity. In addition, current literature suggests a correlation of the positive feelings of an individual, such as job satisfaction and wellbeing, with job performance and engagement (Wright and Cropanzano, 2000, Wright et al., 2007, Rich et al., 2010). Negative emotions, in turn, can result in a decline in job productivity (Quick et al., 1997). The application of these findings to the context of this research means that satisfaction resulting from the use of digital assistants can increase job engagement and performance. Based on the evidence above, this study proposes:

*H8: There is a positive relationship between satisfaction with voice-based digital assistants and job engagement.*

*H9: There is a positive relationship between satisfaction with voice-based digital assistants and individuals' productivity.*

Figure 2 illustrates the relationships between the antecedents of satisfaction with digital assistants, reflecting the beliefs about technology utilisation and the factors specific to these devices. Also, the model illustrates the hypothesised relationships between satisfaction, job engagement and productivity.

**Fig. 2. Research model**

# 4. Research methodology

## 4.1. Data collection

A cross-sectional research design was employed to address the objectives of this study. Before embarking on full-scale data collection, we completed a conceptual pilot study with 49 respondents. The survey included questions measuring the constructs in the model and open-ended questions asking respondents what factors they felt were missing and should be added. The aim of the conceptual pilot survey was three-fold: 1) to ensure that the included factors were relevant when it comes to the use of digital assistants for a work purpose, and 2) to identify the factors that are not present in the literature, but important for respondents 3) to check that the measurement items for each construct are clear and understandable for the respondents. The results of the survey enabled us to conclude that the research model is comprehensive in terms of the coverage of factors. Following the feedback provided by the respondents, the questionnaire was adapted. The final questionnaire contained two parts. The first part included the measurement items of 10 latent constructs and the second part aimed to gather information about the socio-demographic characteristics of the respondents. To test the proposed model and the hypothesised paths, we collected data from UK citizens who were active users of digital assistants, such as Amazon Alexa, Google Assistant or Siri. For the data collection, we employed an independent crowdsourcing company. We received 536 complete and useable responses, whose socio-demographic profile is provided in Table 1.

**Table 1: The Profile of the respondents**

| Demographic Characteristic | Type | Frequency (n = 536) | Percentage |
|---|---|---|---|
| **Age** | | | |
| | 18-24 | 123 | 22.9% |
| | 25-34 | 169 | 31.5% |
| | 35-44 | 119 | 22.2% |
| | 45-54 | 73 | 13.6% |
| | 55-64 | 45 | 8.4% |
| | 65 or older | 7 | 1.3% |
| **Education** | | | |
| | Completed some high school | 20 | 3.7% |
| | Completed some college (GSCE/AS/A-level) | 192 | 35.8% |
| | Bachelor's degree | 239 | 44.6% |
| | Master's degree | 65 | 12.1% |
| | Other advanced degree beyond a Master's degree | 7 | 1.3% |
| | Ph.D. | 13 | 2.4% |
| **Gender** | | | |
| | Male | 239 | 44.6% |
| | Female | 297 | 55.4% |
| **Tasks** | | | |
| | Listen to music | 462 | 86.2% |
| | Listen to audiobooks | 140 | 26.1% |
| | Listen to news | 309 | 57.6% |
| | Start a conversation | 218 | 40.7% |
| | Get an expert opinion | 210 | 39.2% |
| | Search for information | 341 | 63.6% |
| | Set a reminder | 427 | 79.7% |
| | Place an online orders/booking | 87 | 16.2% |
| | Communicate with coworkers (e.g. video calls) | 165 | 30.8% |
| | Manage files | 85 | 15.9% |
| | Control other connected devices | 196 | 36.6% |
| | Set alarms | 422 | 78.7% |
| | Set appointments | 314 | 58.6% |
| | Schedule work tasks | 281 | 52.4% |
| | Take notes (voice notes) | 196 | 36.6% |
| **Years of use** | | | |
| | 1 year ago | 237 | 44.2% |

| | | | |
|---|---|---|---|
| | 2 years ago | 172 | 32.1% |
| | 3 years ago | 82 | 15.3% |
| | 4 years ago | 27 | 5.0% |
| | 5 years ago | 6 | 1.1% |
| | 6 years ago | 2 | 0.4% |
| | 7 and more years ago | 10 | 1.9% |
| **Types of digital assistant** | Google | 186 | 34.7% |
| | Siri | 86 | 16.0% |
| | Alexa | 246 | 45.9% |
| | Facebook Portal | 1 | 0.2% |
| | Cortana | 16 | 3.0% |
| | Other (please specify) | 1 | 0.2% |
| **Most frequently used device to access the digital assistant** | | | |
| | Phone | 167 | 31.2% |
| | Tablet (e.g. IPad) | 15 | 2.8% |
| | PC/laptop | 60 | 11.2% |
| | Stand-alone devices (e.g. Alexa, Google home) | 294 | 54.9% |
| **Voice preference for the digital assistant** | | | |
| | Male | 82 | 15.3% |
| | Female | 454 | 84.7% |
| **% of work done from home** | | | |
| | 0-20% | 99 | 18.5% |
| | 21-40% | 23 | 4.3% |
| | 41-60% | 48 | 9.0% |
| | 61-80% | 64 | 11.9% |
| | 81-100% | 302 | 56.3% |

### 4.2. Measurements

The measurements refer to 10 latent variables, for which we used multi-item scales (Table 2). The respondents were requested to reflect on their own experience when they used digital assistants for work purposes. All latent constructs were indirectly assessed by asking participants to rate relevant statements on a seven-point Likert scale, where anchors ranged between “strongly disagree” (1) to “strongly agree” (7).

**Table 2: Measurement items of constructs**

| **Measurement Item** | **Loading** | **α** |
|---|---|---|
| **Performance expectancy (Venkatesh et al., 2003)** | | 0.938 |
| **Using the digital assistant for carrying out work-related tasks…** | | |
| Is useful. | 0.888 | |
| Enables me to accomplish my work tasks more quickly. | 0.933 | |
| Increases my productivity. | 0.927 | |
| Increases my chances of completing more work-related tasks. | 0.925 | |
| **Effort expectancy (Venkatesh et al., 2003)** | | 0.887 |
| **When using the digital assistant for carrying out work-related tasks …** | | |
| My interaction with it is clear and understandable. | 0.812 | |
| It is easy to become skillful at using it. | 0.876 | |
| I find it easy to use. | 0.912 | |
| Learning to operate it was easy for me. | 0.856 | |
| **Perceived enjoyment (Venkatesh and Bala, 2008)** | | 0.942 |
| **The use of the digital assistant for carrying out work-related tasks …** | | |
| Is enjoyable. | 0.959 | |
| Is pleasant. | 0.954 | |
| Is fun. | 0.927 | |
| **Trust (Chandra et al., 2010, Slade et al., 2015)** | | 0.941 |
| **When using the digital assistant for carrying out work-related tasks…** | | |

| | | |
|---|---|---|
| I trust that it is reliable. | 0.879 | |
| I trust that it is secure. | 0.931 | |
| I believe that it is trustworthy. | 0.943 | |
| I have overall trust in it. | 0.933 | |
| **Perceived social presence (Hassanein and Head, 2007)** | | 0.914 |
| **When I interact with the digital assistant for work purposes…** | | |
| There is a sense of human contact in the digital assistant. | 0.924 | |
| There is a sense of sociability in the digital assistant. | 0.938 | |
| There is a sense of human warmth in the digital assistant. | 0.910 | |
| **Anthropomorphism (Balakrishnan and Dwivedi, 2021, Moussawi and Koufaris, 2019)** | | 0.848 |
| **When I interact with the digital assistant for work purposes, I feel that it ...** | | |
| Is humanlike. | 0.844 | |
| Is conscious of its actions. | 0.861 | |
| Is lifelike and not artificial | 0.922 | |
| **Perceived intelligence (Balakrishnan and Dwivedi, 2021, Moussawi and Koufaris, 2019)** | | |
| **When I interact with the digital assistant for work purposes, I feel that it ...** | | 0.764 |
| Is competent. | 0.820 | |
| Is knowledgeable. | 0.853 | |
| Has intelligent functions. | 0.799 | |
| **Satisfaction with digital assistants (Bhattacherjee and Premkumar, 2004)** | | 0.946 |
| **Using the digital assistant for carrying out my work-related tasks has made me feel …** | | |
| Satisfied. | 0.924 | |
| Pleased. | 0.938 | |
| Happy. | 0.924 | |
| Delighted. | 0.877 | |
| That I should recommend it to my friend. | 0.875 | |
| **Productivity (Tam and Oliveira, 2016, Goodhue, 1995, Oseland, 1999)** | | 0.953 |
| **Using the digital assistant for carrying out work-related tasks has made it possible …** | | |
| To save time. | 0.874 | |
| To do my job more quickly. | 0.919 | |
| To increase my productivity. | 0.922 | |
| To improve the quality of my work. | 0.871 | |
| To accomplish more work than would otherwise be possible. | 0.902 | |
| To perform my job better. | 0.906 | |
| **Job engagement (Schaufeli et al., 2006)** | | 0.956 |
| **Using the digital assistant for carrying out my work-related tasks has made me feel …** | | |
| Bursting with energy at my work. | 0.849 | |
| Strong and vigorous at my work. | 0.882 | |
| Enthusiastic about my job. | 0.913 | |
| Inspired by my job. | 0.875 | |
| Ready to work. | 0.860 | |
| Happy when I am working intensely. | 0.894 | |
| Feel proud of the work that I do. | 0.874 | |
| Immersed in my work. | 0.853 | |

# 5. Results

## 5.1. Data Analysis

SPSS v.26 and AMOS v.26 statistical packages were used to analyse the data. To produce descriptive statistics about the socio-demographic profile of the sample SPSS v.26 was utilised. To test the validity and reliability of the proposed model and investigate the hypothesised paths, we used a two-step Structural Equation Modelling (SEM) technique. The first step concerned the elimination of the

reliability and validity concerns about the measurement model using confirmatory factor analysis. Following the guidelines offered by Hair et al. (2014) measurement model fit indices were assessed, and they were satisfactory: Model fit $\chi 2$ (934) = 2677.176, CMIN/DF = 3.285, CFI 0.922, RMSEA = 0.065. Table 2 shows the results of the assessment of Cronbach's Alpha and factor loadings. In all instances, the Cronbach's Alpha values were above 0.70, indicating that the scales are reliable (Santos, 1999). In addition, factor loadings (>0.7), average variance extracted (AVE>0.5) and construct reliability (C.R. > 0.7) were in line with the requirement (Hair et al., 2014). Table 3 presents the results of the convergent validity test, AVE and C.R. indices.

**Table 3: Convergent validity test**

| | C.R | AVE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Job engagement** | 0.957 | 0.733 | **0.856** | | | | | | | | | |
| **Performance expectancy** | 0.939 | 0.794 | 0.644 | **0.891** | | | | | | | | |
| **Effort expectancy** | 0.890 | 0.670 | 0.474 | 0.653 | **0.819** | | | | | | | |
| **Perceived enjoyment** | 0.943 | 0.846 | 0.631 | 0.727 | 0.706 | **0.920** | | | | | | |
| **Trust** | 0.942 | 0.803 | 0.477 | 0.492 | 0.470 | 0.518 | **0.896** | | | | | |
| **Social presence** | 0.915 | 0.783 | 0.493 | 0.276 | 0.212 | 0.438 | 0.307 | **0.885** | | | | |
| **Anthropomorphism** | 0.856 | 0.666 | 0.457 | 0.324 | 0.177 | 0.363 | 0.326 | 0.697 | **0.816** | | | |
| **Perceived Intelligence** | 0.765 | 0.521 | 0.454 | 0.459 | 0.436 | 0.578 | 0.433 | 0.429 | 0.426 | **0.722** | | |
| **Productivity** | 0.953 | 0.771 | 0.694 | 0.829 | 0.568 | 0.679 | 0.576 | 0.318 | 0.337 | 0.561 | **0.878** | |
| **Satisfaction** | 0.947 | 0.782 | 0.757 | 0.729 | 0.635 | 0.786 | 0.612 | 0.470 | 0.424 | 0.627 | 0.803 | **0.884** |

*Notes: Diagonal figures represent the square root of the average variance extracted (AVE) and the figures below represent the between-constructs correlations.*

### 5.2. Path Analysis

After ensuring that there were no reliability and validity concerns, we embarked on testing the structural model. The model fit indices were satisfactory: $\chi 2$ (830) = 2919.723, CMIN/DF = 3.518, CFI = 0.912, RMSEA = 0.069 (Hair et al., 2014). This made it possible to start testing the proposed hypotheses. Table 4 demonstrates the results of the path analysis. Out of 9 paths, 2 were non-significant (H2 and H6). The results showed that the model explains 77% of the variance in satisfaction with digital assistants, 60% of the variance in job engagement and 68% of the variance in productivity.

**Table 4: The results of the tests of hypotheses**

| ***H*** | ***Path*** | ***Coef.*** | ***t-test, sig*** |
|---|---|---|---|
| H1 | Performance expectancy → Satisfaction with digital assistants | 0.327 | (7.860***) |
| H2 | Effort expectancy → Satisfaction with digital assistants | 0.046 | ($1.142^{ns}$) |
| H3 | Perceived enjoyment → Satisfaction with digital assistants | 0.276 | (5.613***) |
| H4 | Trust → satisfaction with digital assistants | 0.184 | (5.952***) |
| H5 | Perceived social presence → Satisfaction with digital assistants | 0.123 | (3.093**) |
| H6 | Anthropomorphism → Satisfaction with digital assistants | 0.005 | ($0.129^{ns}$) |
| H7 | Intelligence → Satisfaction with digital assistants | 0.167 | (4.332***) |
| H8 | Satisfaction with digital assistants → Job engagement | 0.775 | (17.830***) |
| H9 | Satisfaction with digital assistants → Productivity | 0.827 | (19.180***) |

## 6. Discussion

### 6.1. The Antecedents of Satisfaction

This study investigated the role of digital assistants in carrying out work-related tasks. The result of the analysis showed that all beliefs about technology utilisation, except effort expectancy, positively

correlate with satisfaction with digital assistants. A moderate and positive correlation between performance expectancy and satisfaction supports evidence in prior literature, which uses the construct as a pillar in technology acceptance models to explain the underpinnings of use behaviour (Venkatesh et al., 2012, Venkatesh et al., 2003). Given the profile of the sample, the majority of respondents used voice-controlled devices to support work-related activities by setting appointments, scheduling work tasks and communicating with co-workers (Table 1). That means that they find these services useful for work purposes, which is likely to increase their satisfaction with the device. The relationship between effort expectancy and satisfaction with digital assistants was non-significant, in contrast to the findings of prior literature exploring the role of the factor in using innovative technologies (Pillai et al., 2020, Arfi et al., 2021). Technology adoption theories postulate that when individuals perceive the use of technology as effortless, they tend to develop a positive attitude towards it and initiate behaviour (Venkatesh et al., 2003, Davis, 1989). However, in some recent studies, the effect of effort expectancy was not confirmed (Ashfaq et al., 2020, Ashfaq et al., 2019, Fernandes and Oliveira, 2021). In this paper, the potential explanation of the result is that the sample consisted of active users of digital assistants who had sufficient experience of interaction with the technology. The confirmed moderate and positive relationship between perceived enjoyment and satisfaction is similar to the results in prior research, which postulated that perceived enjoyment determines use behaviour (Holdack et al., 2020, Ashfaq et al., 2020). When individuals have a positive experience during the technology exploitation, such as joy and fun, they become intrinsically motivated to experience it again (Van der Heijden, 2004, Han, 2020). For example, digital assistants can bring entertainment to the work context. On the one hand, the voice control feature adds hedonic experience to the implementation of functional tasks (e.g. setting appointments, organising calls, etc.). On the other hand, digital assistants can deliver entertainment services, such as playing music and reading audiobooks while working. The stronger the feeling of enjoyment associated with the use of voice-controlled devices, the stronger the satisfaction with the devices.

When it came to the factors specific to digital assistants, all except anthropomorphism had significant paths with satisfaction with voice-based digital assistants. The concept of perceived anthropomorphism is used to explain human-computer interaction, especially when it comes to robotics solutions (Fraune et al., 2020, Złotowski et al., 2015, Riek et al., 2009). Although prior research empirically confirmed the positive effects of anthropomorphism on purchase intention, trust in the technology and brand loyalty (Guido and Peluso, 2015, Yen and Chiang, 2020), this study showed that this factor does not correlate with satisfaction when using the technology in the work context. A plausible explanation may be that when voice-controlled devices are used by people to support them in work-related tasks, they are perceived as functional tools rather than human beings. The positive relationships between perceived social presence, perceived intelligence and satisfaction were confirmed, although they were weak. This means that voice-based digital assistants have technical capabilities to provide voice responses and support conversations, which can, to some degree, induce a feeling of their presence and enhance the perception of the devices' intelligence. For instance, respondents reported that they use digital assistants for information search and asking for expert advice (table 3). Similar results were reported in prior literature exploring the application of technology in e-commerce and the service sector (Qiu and Benbasat, 2009, Fernandes and Oliveira, 2021). Scholars pointed that the perceived social presence and the intelligence of virtual agents drive intention to place orders through them (Tan and Liew, 2020). Finally, this study supported the role of trust, meaning that satisfaction with digital assistants increases with the increase in trust in the technology. This finding is in line with research postulating that trust plays a critical role when adopting technology or facilitating purchase intention (Vimalkumar et al., 2021, Yen and Chiang, 2020, Fernandes and Oliveira, 2021).

### 6.2. The Outcomes of Satisfaction

Positive relationships between satisfaction, job engagement and productivity confirm the assumption that the utilisation of voice-based digital assistants has positive implications for work. The effects of satisfaction on both variables are very strong, which means that the higher the satisfaction with devices the more engaged individuals are with their work and the higher the output of their work. On the one hand, the findings support the wide stream of information system management research focusing on technology implications in a work context (Liu et al., 2017, Passalacqua et al., 2020, Hammedi et al., 2021, Fuller and Dennis, 2009). Specifically, this research extends the discussion on the positive consequence of the use of technology in improving performance, emphasising the role of the capabilities of technology when it comes to implementing the required tasks (Lin, 2012, Goodhue and Thompson, 1995, Fuller and Dennis, 2009). On the other hand, such results provide complementary evidence to the narrower stream of literature exploring the consequences of integrating artificial intelligence in organisations (Dirican, 2015, Akerkar, 2019, Loureiro et al., 2020, Di Vaio et al., 2020). While prior studies discussed the advantages of the replacement of the labour force and manual processes (Katz and Margo, 2014, Li et al., 2017, Nikolic et al., 2017), this research confirms the benefits of AI technology supporting people in carrying out work-related tasks. Given the profile of the respondents, a large number of surveyed people had used digital assistants for setting reminders, appointments, communicating with co-workers, scheduling work tasks and taking notes (Table 1). This means that the technology has high utility for work-related purposes, which has a direct correlation with individuals' performance and engagement patterns. Also, following the literature on the positive role of technology in employees' performance (Liu et al., 2017, Passalacqua et al., 2020), the interactivity of digital assistants could add playfulness to the implementation of work-related tasks. The feeling of playfulness, in turn, positively contributes to job engagement and productivity (Passalacqua et al., 2020, Silic et al., 2020). Finally, the results could also mean that satisfaction resulting from the use of digital assistants for work purposes increases the predisposition to use the technology, affecting individuals' productivity.

### 6.3. Theoretical and practical contributions

The study makes three contributions to theory. First, the study contributes to the literature on AI applications in the workplace. By exploring the factors of satisfaction and the impact of AI-powered digital assistants on individuals' productivity and engagement, this study provides evidence about the role of AI in complementing and supporting workers' activities. These findings add to the current research, which has mainly focused on AI technology that can replace manual processes and the human workforce (Katz and Margo, 2014, Li et al., 2017, Nikolic et al., 2017, Zhong et al., 2017). The empirical examination of the factors conducive to AI technology utilisation and its benefits is important, given that the conditions of AI adoption are different when it comes to technology that provides a supporting rather than substituting role in the workplace.

Second, the study contributes to the literature on voice-based digital assistants (Bavaresco et al., 2020). By examining the benefits of the technology in the work context, the study brings new evidence about the application and the impact of the utilisation of digital assistants beyond the delivery of personal services. This evidence brings insight which is different from that provided in the existing research considering digital assistants as a predominantly consumer technology applied in e-commerce settings (Balakrishnan and Dwivedi, 2021, Vimalkumar et al., 2021, Yen and Chiang, 2020). By exploring the role of AI-based digital assistants for work purposes, we extend the boundary of the understanding of technology applications. Also, by providing enriched knowledge about new technology use cases, we address a recent call to examine the effect of digital technologies in

transforming or adjusting people's lives in "the new normal" conditions (Carroll and Conboy, 2020, Venkatesh, 2020).

The third contribution of this study concerns the findings related to the implications of remote work when using AI-based technology that can facilitate positive job outcomes through the delivery of supporting services. While prior literature on AI discussed the implications of technology for public and private domains, such as healthcare, logistics or manufacturing (Dirican, 2015, Akerkar, 2019, Loureiro et al., 2020, Dwivedi et al., 2019, Hamet and Tremblay, 2017), it did not examine the work-related benefits of AI applications and services, which are typically found in home settings. The confirmed antecedents of satisfaction and the positive impact of digital assistants shed new light on the conditions of employees enabled by the technology which favours productivity in the remote work settings. This understanding is important given the long-term consequences of COVID-19 on remote work patterns.

The results of the research have a number of practical implications. Firstly, the findings offer insights that are useful for the research and development team of AI-enabled digital assistants. In the light of the findings that the applications of the devices can be extended for work purposes, the developers of the technology could introduce more features with a functional value in delivering tasks. For example, the effect of performance expectancy on satisfaction suggests that the users of devices expect the technology to be useful for carrying out work-related tasks. To make technology more useful for remote employees, the technology should also trigger a feeling of social presence and intelligence. Considering that algorithmic capabilities vary among AI devices (Lichtenthaler, 2020), developers need to enhance the analytical and interactional functionality of the technology. Secondly, the findings inform managerial practices. The positive relationships between satisfaction, job engagement and productivity suggest that the entertainment elements of using digital assistants in the work context could entail positive outcomes. Therefore, organisations should consider introducing engagement and interaction-facilitating tools at work, which could potentially increase individual performance. Also, the findings inform managers about the conditions that can affect employees' performance while working remotely. Such knowledge is useful for developing performance indicators and evaluating the factors affecting employees' job practices. Thirdly, the findings of the research offer implications for marketers, who should consider a wider segment of the population (i.e. working professionals) for promoting digital assistant devices and services.

## 7. Conclusion

In an attempt to address the gap in the current literature, this study investigated the utilisation and the implications of voice-based digital assistants in the work context. The research explored 9 factors drawn from the research on information system use and digital assistants which potentially underpin the use of devices for work purposes, such as performance expectancy, effort expectancy, perceived enjoyment, trust, perceived social presence, anthropomorphism and intelligence. To validate the relevance and ensure the comprehensiveness of the list of factors, a conceptual pilot study was conducted, followed by a full-scale data collection. The path analysis showed that out of the investigated technology utilisation beliefs, the perception that devices can ensure a good performance and are enjoyable in use determine the degree of satisfaction with them. When it comes to factors specific to digital devices, trust, the feeling of social presence and the perception of digital assistants' intelligence correlate with satisfaction. To understand the implications of voice-based digital assistants, the study examined and confirmed the strong relationship between the satisfaction with devices, individuals' job engagement and productivity.

### 7.1. Limitations and future research avenues

The paper has a number of limitations that future research can take into consideration. The first limitation refers to the inability to infer whether the results of the model testing would be different if comparing samples of respondents from countries with different levels of diffusion of technology such as digital assistants. While the respondents were from different geographical locations, we did not balance respondents by their country of origin, making it impossible to segment them into distinctive samples. Future studies can conduct comparative research to test whether the determinants and the outcomes of satisfaction with digital assistants are consistent across countries with different technological infrastructure. Another avenue for future research is to understand the dependence of job-related outcomes on the types of tasks for which digital assistants were used. In the frame of such research, comparative sub-studies need to be carried out, each focusing on individuals mainly using devices for specific work-related tasks. Finally, it will be useful to test the model after the pandemic, when employees are working from home on a voluntary basis or using digital assistants when working from offices. Such a study can bring new insight, given that in conditions of restricted choice and emotional distress, the perception of enjoyment and the interaction experience could be different.

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