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THE COMBINED EFFECTS OF VIRTUAL ASSISTANT AND AUGMENTED REALITY TOOLS ON ENHANCING CUSTOMER ENGAGEMENT IN THE FURNITURE INDUSTRY

Bachelor's thesis
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I hereby declare that I have compiled the thesis independently and all works, important standpoints, and data by other authors have been properly referenced and the same paper has not been previously presented for grading.

The document's word count from the beginning of the introduction section to the end of the conclusion section is 8,413.

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ABSTRACT

In the current market, the use of technological advancements has had a vital impact on various industries. New applications and concepts are constantly being introduced to markets. The importance and effects of such technologies have gained significant interest among marketers and researchers. In this thesis, the author focuses on the use of virtual assistant (VA) and augmented reality (AR) tools in the furniture industry and their associations with customer engagement (CE). This thesis aims to determine the effects of these tools across three dimensions: perceived ease of use, perceived usefulness, and perceived value. The results of this study revealed that current implementations of VA and AR tools in the furniture industry had insignificant effects on CE. However, the author suggests that the capabilities of these tools would be significant if they were utilized properly, which would enable their application in future marketing strategies.

Keywords: customer engagement, artificial intelligence, augmented reality, virtual assistants

INTRODUCTION

The consequent changes in living standards have led to a constant and increasing demand for products in the furniture industry (Furniture Report, 2022; Statista, 2022). The influence and size of the furniture market have continued to increase annually worldwide. At the same time, the role of modern technology in everyday life has increased, and devices such as smartphones and tablets have become more accessible to all customers. From a marketing point of view, a comprehensive understanding is needed to utilize up-to-date marketing tools according to the needs and preferences of customers.

Marketing strategies and approaches must change over time, and retailers should allow customers to "engage with multiple channels" (Pallant et al., 2020, pp. 859). Accordingly, the continuous growth in the number of internet and smartphone users has created the possibility of promoting online shopping through online applications. Because of these changes in customer behavior, the furniture market has become one of the fastest-growing markets (Furniture Report, 2022; Statista, 2022).

While investigating the associations concerning the use of modern marketing tools and their effects on CE, the author discovered that previous empirical research on the subject has shown contradictory results. Because the use of different marketing technologies varies, further research concerning specific tools and their effects on CE is needed. In the furniture industry, commodities are chosen based on individual preferences and limiting factors. The need for the proper utilization of marketing tools that can provide personalized products and services has become increasingly evident.

To the best of the author's knowledge, previous studies in the literature on the furniture industry lack knowledge of the relationship between modern marketing tools and factors associated with CE. The actualization of this thesis' topic was based on the author's observations and with the aim of leveraging modern marketing tools to capture possibly overlooked revenue opportunities. Additionally, the author's reasoning was rooted by logical observations and beliefs that utilizing these marketing tools could offer invaluable benefits that might be difficult to obtain otherwise.
The goal of this research was to analyze this association by focusing on the use of virtual assistant (VA) and augmented reality (AR) tools. In addition, this thesis aims to provide additional information about customer experiences with VA and AR tools.

Based on the literature review, this study focused on the following three characteristics or dimensions of using VA and AR tools: perceived ease of use, perceived usefulness, and perceived value. Although these dimensions have been previously studied, companies' knowledge about the factors that affect CE in the furniture industry regarding the use of modern marketing tools is lacking. Thus, the research problem of this thesis is to identify what factors affect the acceptance of modern marketing tools among customers in the furniture industry and how do they influence CE.

Based on the literature review, this thesis aims to answer two research questions:

RQ1: What is the impact of VA and AR tools on CE in the furniture industry?

RQ2: What are the strengths and weaknesses of VA and AR tools?

To gain a comprehensive understanding of the subject, data were gathered from two sources. The theoretical background was investigated using secondary data sources, such as books, scientific articles, and previous studies related to the subject. The research design of this thesis was based on the author's findings from the literature review and recurring themes and issues associated with the utilization of VA and AR tools in the furniture industry. Primary data were then gathered from an online survey conducted by the author.

This thesis is organized as follows. First, a review of the literature on the subject is conducted, including the various definitions and core concepts of CE, VA, and AR, as well as their associations with the furniture industry. Second, the collection of data on customers and the structure of the online questionnaire are described. The research method, design, and sample are then presented. Finally, the relevance and meaning of the gathered data are discussed, and the results are reflected in light of the previous literature. The limitations and strengths of this research are discussed before conclusions are drawn and directions for future research are suggested.

1. LITERATURE REVIEW

1. Customer engagement

The concept of CE has been widely studied based on differing perspectives. Although the concept of CE has existed in the academic literature since 2006, no conceptual agreement regarding its definition has been published (Algharabat, 2018). Instead, marketing scholars have collectively described it as a multidimensional concept that can be perceived from several perspectives (van Doorn et al., 2010).

Van Doorn et al. (2010) described the concept of CE as derived from motivational drivers, in which a customer deliberately chooses to exceed the limitations required for a core transaction. It has been seen as a behavioral manifestation of a brand or a firm. A value-based approach was presented by Kumar et al. (2010), who described CE as the "active interactions of a customer with a firm, with prospects, and with other customers, whether the interactions are transactional or non-transactional in nature." (Kumar et al. 2010, pp. 297) Finally, a holistic perspective was introduced by Pansari and Kumar (2017, pp. 295), who defined CE as the "mechanics of a customer's value addition to the firm, either through direct or/and indirect contribution."

When the concept of CE and customer's behavioral and psychological aspects were examined in marketing-related studies (Brodie et al., 2011), CE was described as three-dimensional, consisting of cognition, conation, and emotion. Van Doorn et al. (2010) conceptualized CE as having a five-dimensional structure consisting of valence, modality, scope, nature of the impact, and customer goals. Subsequently, So et al. (2014, 2016) introduced an additional five dimensions: identification, attention, absorption, enthusiasm, and interaction. The review thus far revealed that

CE is a multidimensional construct, which can vary across different dimensions (Brodie et al., 2011).

According to So et al. (2014, 2016), discrepancies in the conceptualization of CE and its various manifestations have not prevented the use of CE as a marketing concept. Instead, they emphasized that the concept of CE can be approached from many perspectives as long as they include the nature of customer interactions. The goal of using CE in marketing is to produce desirable actions by retailers and customers (So et al., 2014, 2016), such as purchase intentions, loyalty, and brand attitudes. Additionally, CE can be used to discourage undesirable actions, such as brand switching (Brodie et al., 2011).

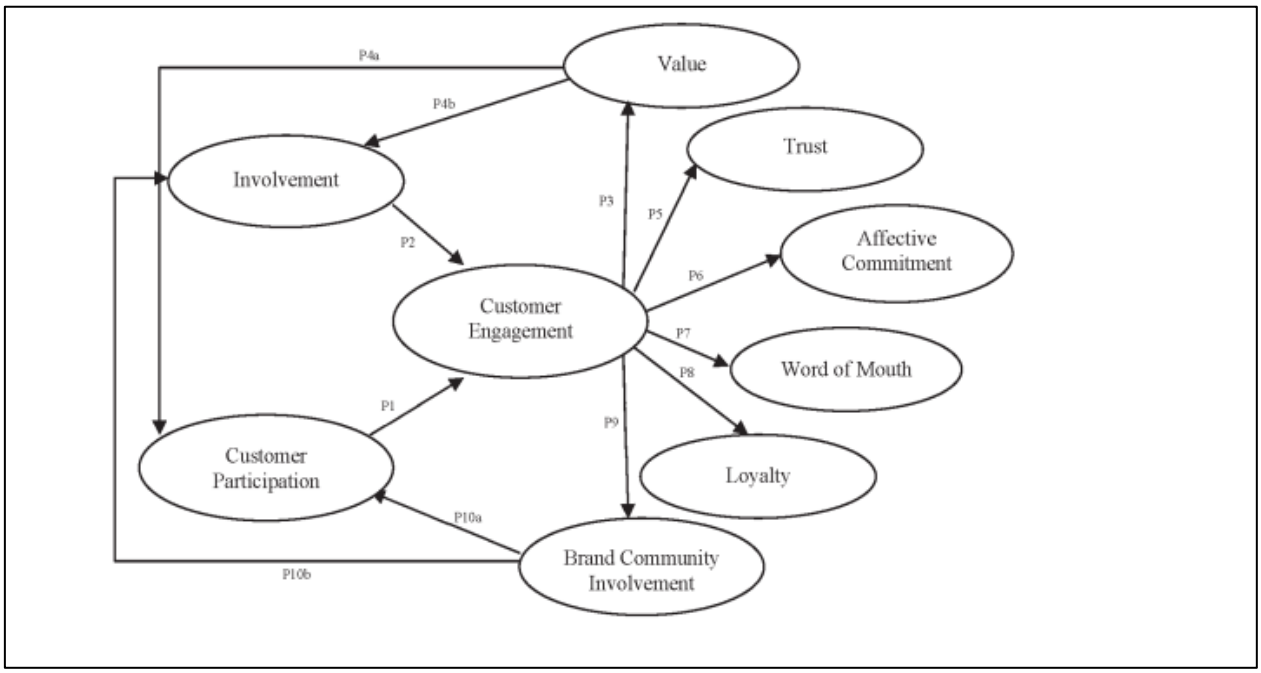

Figure 1. Model of customer engagement presented by Vivek et al. (2014)

Several different models of CE have been presented in the literature. In this study, Vivek et al.'s (2014) model was used to analyze the concept of CE.

1.1. Customer engagement and demographics

The use of CE in marketing has gained significant interest among companies over the past century. The ability to create engaging customer experiences is important for companies, as it can help them separate themselves from their competitors in the market. Consequently, the growing interest in CE has led to policy whereby a substantial number of resources and efforts by companies have been allocated to create significant CE experiences (Verhoef et al., 2010). Therefore, customers can be regarded as active contributors because their decisions and actions can influence various marketing sectors (Malthouse et al., 2013). According to Kozinets et al. (2010), customers could also be referred to as pseudo-marketers who actively contribute to marketing through word-of-mouth and brand loyalty, and they often have a greater influence than some firm-based counterparts. Furthermore, Malthouse et al. (2013) pointed out that regardless of the deliberate or indeliberate actions that firms take to guide their customers, the impact of customers across marketing sectors must be acknowledged.

The control of marketing power has shifted toward the customer, as they can actively influence various platforms of social media and communication. This transfer of control has created a dilemma, which, from the company‘s point of view, can be seen as either a potential opportunity or a threat (Verhoef et al. 2010). Customers can be considered an incredibly valuable asset for companies, as they can provide otherwise unattainable resources, such as creativity, knowledge, and customer-perceived experiences (Harmeling et al., 2017). Thus, for companies, a question remains regarding how to identify the most beneficial way to incorporate CE into their marketing strategies (Malthouse et al., 2013).

Customer characteristics have been studied to influence customer behavior, CE, and the purchase decisions of customers. According to Rani (2014), socioeconomic factors such as age, income, occupation, and lifestyle can have a significant impact on customer behavior. That study focused on the effects of customer culture, social class, personality, and psychological factors, emphasizing that these need to be understood in developing marketing strategies.

Although age is considered to have a major impact on customer acts, only a few studies have focused on this subject (Herve & Mullet, 2009; Rani, 2014). Herve and Mullet (2009) reported that their comparison of variously aged customers who were observed buying clothes showed that the product’s price, durability, and suitability were weighted differently. Young study participants

(18–25 years) put more weight on the product price, whereas middle-aged (35–50 years) and elderly (65–90 years) valued the suitability and durability of the product, respectively. Only a few studies have included the important topic of gender in examining customer behavior and engagement. Although gender is known to moderate CE, mixed results concerning the impact of gender have been presented (Islam & Rahman, 2017; Islam et al., 2017). As described in a previous studies men and women process information differently. While men are inclined to process information based on only a few details, women tend to obtain information from multiple sources prior to making a decision (Ladhari & Leclarc, 2013). According to social role theory, it is thus plausible that women, compared with men, may be likelier to engage in customer purchases because they tend to look at more information before making a purchase decision. Gligor et al. (2022) found that, compared with men, women displayed higher levels of customer purchase, influence, and knowledge, but not referrals. Gligor et al. (2022) concluded that the important effect of gender on CE needs to be understood in building marketing strategies.

1.2. Artificial intelligence and virtual assistants

According to Russell and Norvig (2016), any machine or computer that aims to mimic the cognitive and affective functions of a human can be considered to represent a form of artificial intelligence (AI). In addition, the Cambridge Dictionary (2022) defines AI as a machine that has the "ability to understand language, recognize pictures, solve problems, and learn" (Cambridge Dictionary, 2022).

According to a systematic review by Verma et al. (2021), in marketing, AI is based on three basic components: machine learning, neural networks, and deep learning. These components were defined as follows:

- Machine learning: AI provides machines with the ability to do tasks without preexisting code or instructions. With the help of AI and information gained from various tasks and examples, the machine learns to solve problems, and based on the gained knowledge, it adapts to the given situation. Thus, with sufficient and proper utilization, machines can learn to do various tasks.
- Neural networks: A form of AI that consists of three layers: an input layer, a hidden layer, and an output layer. Each layer consists of thousands, if not millions, of nodes, which, by interacting with each other, form a collective network.

- Deep learning: The mechanism of deep learning is based on the function of neural networks. These networks aim to mimic the functionalities of the human brain and their unique responses.

Notably, the subject of AI is complex, and various definitions of AI exist in the academic literature. In this thesis, these definitions are used only to provide the information required to understand the basics of this subject, and they may be insufficient to describe the complexity of the subject.

Also referred to as digital assistants, VAs utilize a highly complex and advanced form of AI technology (Brill et al., 2019). These assistants can learn to recognize and respond to various forms of input, such as voice, visual, and contextual information (Hauswald et al., 2015). They are capable of recognizing customer patterns and preferences through different forms of machine learning (Kumar et al., 2016). Although the functionality of these systems can vary from one customer to another, they are capable of performing a wide scope of different tasks, varying from the most basic to the most advanced (Brill et al., 2019).

The utility of digital assistants has already been highly identified across technological market leaders, such as Apple's Siri, Amazon's Alexa, and Google Assistant (Canbek & Mutlu, 2016). Previous findings have shown that customers have rapidly embraced the use of these digital assistants (Canbek & Mutlu, 2016). Platform integrations of AI are referred to as chatbots or conversational agents. They are based on computer programs that aim to simulate human-type conversations by a series of voice or text commands (Luo et al., 2019). With the help of AI, chatbots are now equipped with features such as enlightened speech recognition and language processing (Wilson et al., 2017). This is done by either pre-programmed codes or forms of machine learning. This allows for flexible input and enables the adaptation of chatbot responses accordingly (Gacanin & Wagner, 2019). AI allows chatbots to provide insightful, responsive, and even humorous responses to customers (Wilson et al., 2017). In addition, chatbots can provide real-time information with a high degree of reliability and convenience (Baier et al., 2018). Thus, the use of chatbots can provide a range of benefits for both customers and retailers. The use of AI in the form of chatbots also offers various benefits for companies. It provides automated customer service and simultaneously offers the possibility of the first engagement. For a company, the use of AI provides an opportunity to track real-time data by analyzing the responses of customers (Wirth, 2018). The use of AI also mitigates the possibility of human error because chatbots do not have "bad days" (Luo et al., 2019).

In the present business environment, fierce competition and technological advancements have changed the ways in which organizations operate (Gans, 2016). Previous studies have considered AI to be a part of our future society (Davenport et al., 2020) because it can be used in a wide range of business scenarios. Industries have rapidly adapted to changes in the field of marketing. The market size of chatbots in 2017 was 250 million (Pise, 2018), and in 2018, a study by Peart (2018) estimated that in 2020, 85% of customer relationships were managed without human interaction. According to Moar & Escherich (2020) 4 billion digital assistants were used worldwide by the end of 2020. Additionally, they estimated that by 2024, over 8 billion digital assistants will be used worldwide.

1.3. Augmented reality

Augmented reality (AR) refers to a technology in which computer-generated visuals are overlayed in the user's real-world setting (Sudharshan, 2020). This is usually done using handheld devices such as mobile phones. The use of AR provides users with digitally created information that is added to their existing surroundings in real time (Paelke, 2014).

Because the term virtual reality (VR) is occasionally used interchangeably with AR, they can be easily confused. Although these technologies are similar, it is important to acknowledge the distinctions between them. In short, VR refers to a technology that aims to fully substitute our view of reality (Riar et al., 2022). When it is utilized, the user is completely engaged in a virtual environment (Pantano et al., 2017). In contrast, AR aims only to modify and overlay digital elements in our existing world. Rather than substituting our reality, it simply creates something that is additional to our surroundings (Sudarshan, 2020). Although these technologies have several similarities, they are used in different contexts to address information differently (Milgram et al., 1995).

Several studies have been conducted to analyze the benefits of AR for customers and retailers. Díaz-Martín Martin et al. (2021) recognized that, compared with traditional 2D methods of product presentation and purchasing online, AR was more effective in providing customers with essential information they needed (Díaz-Martín Martin et al., 2021). Moreover, the perceived information gained from the virtual and interactive features of AR tools has been described as a contributing factor in reducing product uncertainty among consumers (Bonnin, 2020). Furthermore, previous studies in the literature have found that the use of AR may help to diminish inventories of customers' returned purchases. Considering the fact that 10% of the inventory purchased is

returned, the impact on monetary, environmental, and sustainability costs can be remarkable (Robertson et al., 2020). For the customer, the implementation of an AR tool can also provide an experience of improved accessibility and convenience as it offers a new way to interact with products. In addition to a unique shopping experience, it helps to create personalized interactions with companies (Caboni & Hagberg, 2019).

Because they can increase the number of interactive opportunities, AR technologies have influenced advertising strategies. Caboni and Hagberg (2019) concluded that the use of AR mobile applications is a convenient method for increasing brand awareness and customer loyalty. Moreover, retailers have gained data on their customers' experiences and perceived values in using the application (Caboni & Hagberg, 2019). AR mobile tools have also been found to support customers in the online and offline environments of retailers (Díaz-Martín Martin et al., 2021).

The effects of the new technology can be described as both positive and negative (Roggeveen et al., 2020). Romano et al. (2022) studied the attitudes of 503 customers toward AR tools. In their study, the customers described the convenience and accessibility brought about by the new technology as a positive factor. However, the information provided by new technologies does not always lead to a positive outcome (Roggeveen et al., 2020), as some consumers find the complexity of different choices challenging (Romano et al., 2020). When such information is provided to the customer, it could lead to an "overload" of stimuli, resulting in an overwhelming experience (Roggeveen et al., 2020). The concept of information overload was originally presented by Li (2017). A few years later, Roggeveen et al. (2020) described it as stimulus load theory, referring to a situation in which the information given by the tools or technologies exceeds the processing capability of a customer. Hence, the amount of information provided to customers must be optimal. As companies strive to maximize the benefits of AR, they need to recognize the variability among customers and their ability to utilize the technology (Chen et al., 2021). The results of previous studies suggest that retailers also need to understand the limitations of AR technologies (Romano et al., 2022) but not reduce customer experiences associated with the use of AR tools (Roggeveen et al., 2020).

1.4. Technology acceptance model

As technological development continues at an unprecedented rate, its impact on users‘ lives also increases. Questions regarding the factors that directly influence the acceptance and rejection of technologies remain unclear, but this issue has appeared in various academic studies for over a quarter of a century (Marangunić & Granić, 2015). In 1986, Fred Davis proposed a model that examined the factors that affected either users' acceptance or rejection of new technologies (Davis, 1986). This model is known as the technology acceptance model (TAM), which aims to examine human behavior and attitudes toward technologies and their effective use (Marangunić & Granić et al., 2015). In presenting the TAM, Davis proposed that the use of a system can be explained by the user's motivation, based on three concepts: perceived usefulness, perceived ease of use, and attitude toward using technology. The user's attitude was influenced by the factors of perceived ease of use and perceived usefulness (Davis, 1986).

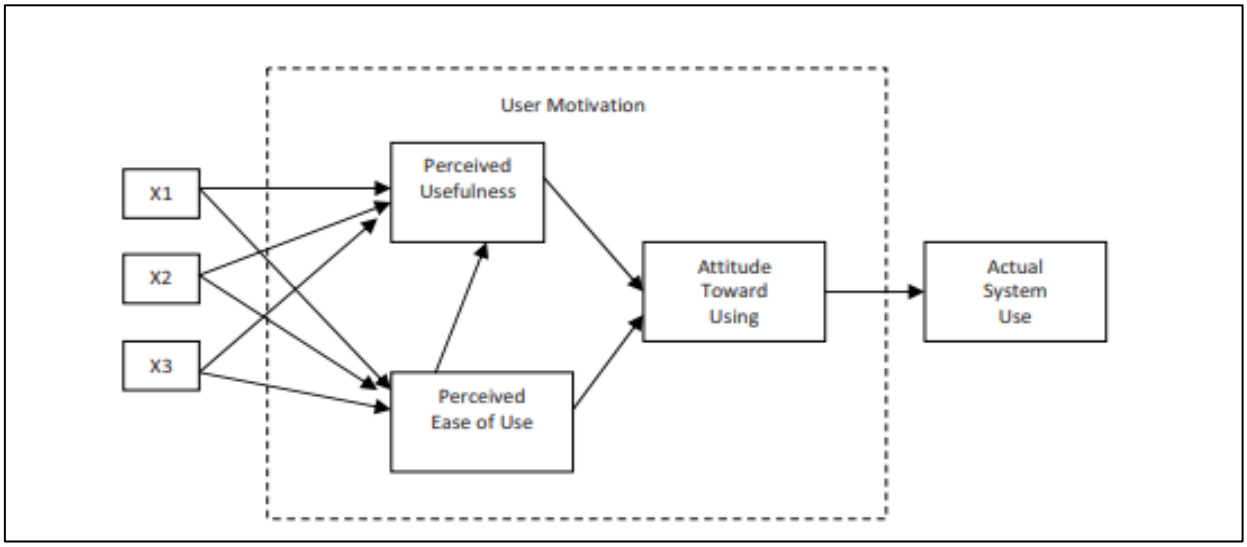

Figure 2. The technology acceptance model (Davis, 1986)
Source: Marangunić & Granić (2015)

The factors associated with user's attitudes were described as follows:

- Perceived usefulness: "The degree to which an individual believes that using a particular system would enhance his or her job performance." (Davis, 1986, pp. 82)
- Perceived ease of use: "The degree to which an individual believes that using a particular system would be free of physical and mental effort." (Davis, 1986, pp. 82)

In the past two decades, the use of TAM in the literature has increased significantly. Various forms of the model have been applied to gain a better understanding of the attitudes that affect the acceptance of new technologies (Chuttur, 2009).

1.5. Importance of modern marketing tools

As previous research has underlined, the present retail industries have been driven by a radical change in technological advancements (Guha et al., 2021), and the concepts of CE and authentic experiences have become increasingly important (Islam et al., 2017). The use of these technologies allows for highly personalized content on a real-time basis (Baier et al., 2018). Hence, they have been unrivaled in the field because they can provide both goal-directed and pleasure-directed customer experiences (Lavoye et al., 2021).

Because of rapid technological advances, tools such as AR can now be used as platforms for co-creation (Alimamy et al., 2018). The use of AR was previously neglected because of the impractical size of devices (Rese et al., 2017). However, the improvement in technology has now led to a newfound interest among retailers and developers in implementing mobile AR applications (Dacko, 2016). To enhance and improve customer experiences, companies such as Sephora, L'Oréal, Nike, and Adidas have portrayed their products through forms of AR technology (Archer, 2016).

To clarify, Lunardo & Guerinet (2009) reported that authentic experiences have been found to influence customer purchases in online settings. In addition, Bechwati et al. (2005) underlined the importance of this influence, emphasizing that online purchase environments should be informative. The customer's ability to evaluate products is directly related to the information provided by retailers. According to the report by Accenture Research (2011), most product returns are not based on product defects but on negative post-purchase evaluations. According to Kerr (2013), the impact of product returns had a severe effect on retailers' cost margins. In 2013, the annual amount of customer returns in the US was reported to be $264 billion.

The impact of technological development can also be seen in the furniture industry, and a considerable body of literature exists about the relevance of technology for retailers. Andreu et al. (2010) examined the importance of value co-creation methods for furniture markets. Their

research showed the importance of the value that companies create for customers. Gummesson (2007) found that customers did not only purchase products or services, but also the perceived values that they were expected to gain from products. Moreover, Sheth & Uslay (2007) found that understanding the relationship between customers and companies can lead to mutually beneficial values.

In this study, the furniture industry is represented by companies whose actions, according to Statista (2022), involve the manufacturing, distribution, and retail sales of furniture equipment. Commodities that support customers' actions and functions, such as sleeping, working, eating, and storing, can be considered furniture. Additionally, they are regarded as unmovable household objects, such as sinks and faucets.

2. DATA COLLECTION AND METHODS

This chapter describes the data collection and analytical methods used in this research.

2.1. Research design

To conduct a suitable questionnaire for this study, the author had to gain a deeper understanding of the fundamental and essential details associated with the research design. To accomplish this, the author utilized secondary data, including web pages, previously published articles, and studies related to the field. The research methodology selected for this research was based on the authors' observations of recurring themes and issues in using VA and AR tools. Because the use of these tools continues to increase rapidly, the aim of this thesis was to analyze the effects on the furniture industry of VA and AR tools across three dimensions. The TAM model was chosen to study two dimensions—perceived ease of use and perceived usefulness. The third dimension, perceived value, was selected based on Baier et al.'s (2018) study, which showed that the perceived value that these tools offer can be obtained through changes in the levels of confidence, information, and presentation, as well as purely hedonic factors. Therefore, perceived ease of use, perceived usefulness, and perceived value were selected to analyze the CE associated with the use of VA and AR tools.

2.2. Research methods

To achieve the aim of this thesis, a quantitative analysis method was utilized. Data on user experiences with VA and AR were collected using an online questionnaire. The content and elements of the questionnaire were based on the findings of the literature review and literature-

based understandings of the subject. The Google Forms tool was used to build the questionnaire, and convenience sampling was used because of its speed, flexibility, and low cost.

The study sample of this thesis was formed of individuals over 18 years, i.e.. the possible customers of furniture industry and the access to modern marketing tools. The author recruited respondents from his family, friends, and acquaintances. The questionnaire was conducted only in English, which eliminated some potential respondents from the study. Questions concerning the respondents' gender, age, and country of residence were included to analyze the demographics of the study sample. The questionnaire included a trial of one VA tool and questions concerning user experience. For the questionnaire, the VA tools of Asko, Sotka, and Finnsoffa were chosen to represent chatbots used in the Finnish furniture industry. For all Finnish and Estonian respondents, one of three chatbots was randomly selected from the questionnaire. All American respondents were asked to try the Ikea chatbot because the Finnish chatbots were not available in the US.

To explore VA-associated user experiences, 12 five-point Likert scale questions and one open-ended question were asked. The three selected dimensions were analyzed as follows: ease of use was analyzed by three questions concerning ease of use, understandability of the VA tool language, and accessibility of the tool. The amount of perceived usefulness was analyzed by questions concerning the product knowledge of the tool, the tool's ability to respond to given answers, and the ability of the tool to speed the possible purchasing task. To analyze the third dimension, the perceived value of the VA, the respondents were asked whether they considered that the use of the VA tool gave added value in terms of the product purchase and helped them to understand the intended purchase, and whether it helped them to differentiate the product's features and differentiate it from other products on the market.

The latter part of the questionnaire consisted of a trial and questions concerning the use of an AR tool. The Ikea Place app was chosen for the survey because it is available in all countries. All respondents were asked to upload the Ikea Place app first, and after using it, 12 five-point Likert scale questions and one open-ended question were asked to analyze the user's experience. The three dimensions were studied in detail using the same questions asked regarding the use of the VA tool. The last question was open-ended and asked the respondent to provide comments concerning the use of the VA and AR tools. The questionnaire used in this study is presented in the Appendix.

2.3. Data collection and analysis

The questionnaires were sent from 17 to 23 November 2022. Before answering the questionnaire, all participants were informed of the voluntary nature of the study and their anonymity concerning all given answers.

The statistical analysis of the data was performed using the Statistical Package for Social Science (SPSS) software version 22, and a p-value <0.05 was considered statistically significant. A chi-square test and Mann–Whitney U or Kruskal–Wallis tests were used to determine differences in categorical and continuous variables. The correlations of the variables were determined using Spearman's correlation test. Nonparametric tests were used because the sample size was small, and the distribution of the answers to the questionnaire was uneven.

3. RESULTS

This chapter describes the results of the data gathered from the responses to the online questionnaire. The results are discussed in relation to the research questions and interpreted by the author.

3.1 Sample demographics

In total, 54 respondents answered the questionnaire. More than half of the respondents were men (n = 28), and one-third of the respondents were women (n = 17). Nine respondents did not want to provide information concerning their gender.The majority of the respondents lived in Finland, but some were in the US and Estonia. Six respondents did not provide information about their country. The mean age (± standard deviation) of the respondents was 35.4 ± 15.5 years. (Table 1)

The age distribution was uneven, and more than half of the respondents were under 30 years of age. Respondents over 50 years of age formed the second-largest age group.

Table 1. Demographics of the study sample (the author)

	Number	**Percentage**
Gender		
Female	17	31.5
Male	28	51.9
Unknown	9	16.6
Country of residence		
Finland	39	72.2
Estonia	3	5.6
US	6	11.1
Country of residence unknown	6	11.1
Age		
< 20 years	3	5.6
20–29 years	25	46.3
30–39 years	1	1.9
40–49 years	5	9.3
≥ 50 years	15	27.8
Unknown	5	9.3

The age distribution was uneven, and more than half of the respondents were under 30 years of age. Respondents over 50 years of age formed the second-largest age group.

3.2 Descriptive statistics

Asko's VA tool was the most frequently used (23 respondents). Sotka's and Finnsoffa's VA tools were used by 11 and 12 respondents, respectively. Ikea's VA tool was tested by only eight respondents in the US. The usage proportions of the VA tools are shown in Figure 3.

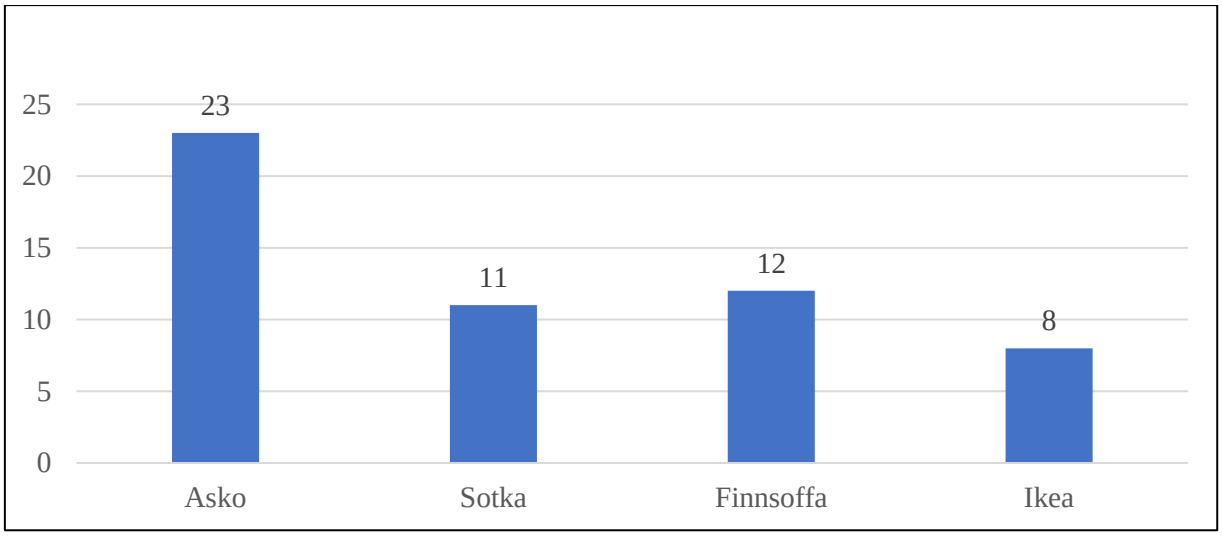

Figure 3. Number of users of the different VA tools
Source: the author

The answers to questions concerning the use of the VA tool showed that the respondents gave the highest mean value (3.9) for the ease of use of the VA tools. On the five-point Likert scale, the mean values of perceived usefulness (3.0) and perceived value (2.9) remained neutral (Figure 4).

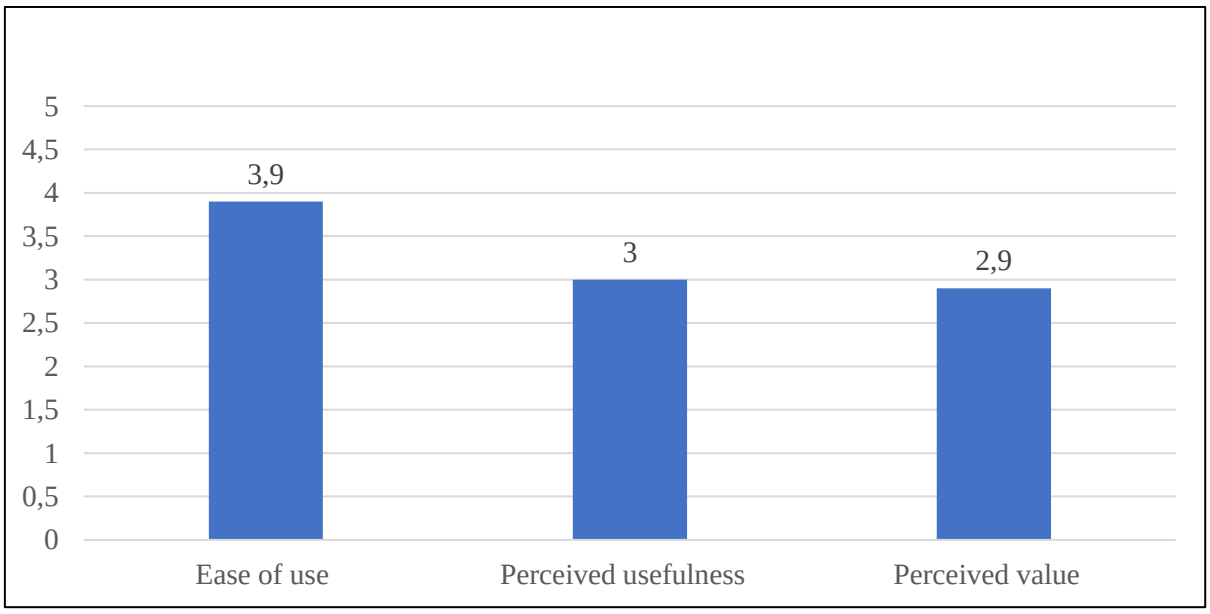

Figure 4. Mean values associated with the use of a VA tool and based on the three studied dimensions (n = 54)
Source: the author

The analysis of the answers to the questions also showed that the highest mean value (4.2) was given to ease of access to the tool. The answers to questions concerning ease of use showed that

the questions presented by the tool were considered understandable (3.9), and the use of the tool was considered effortless (3.6). The answers to the questions concerning the perceived usefulness of the tool remained neutral. The tool did not help to speed the product purchase or enhance the knowledge of the product (2.9), and the ability to respond to all needs of the customer (2.6) remained below the neutral level. The perceived value of the tool was considered low. The use of the tool did not give additional value to the product (2.7) and did not help the respondent to better understand the intended purchase (2.6). The tool's ability to differentiate the product features (2.7) and the product of interest from others remained low (2.4). The results concerning the use of the VA tool are presented in Figure 5.

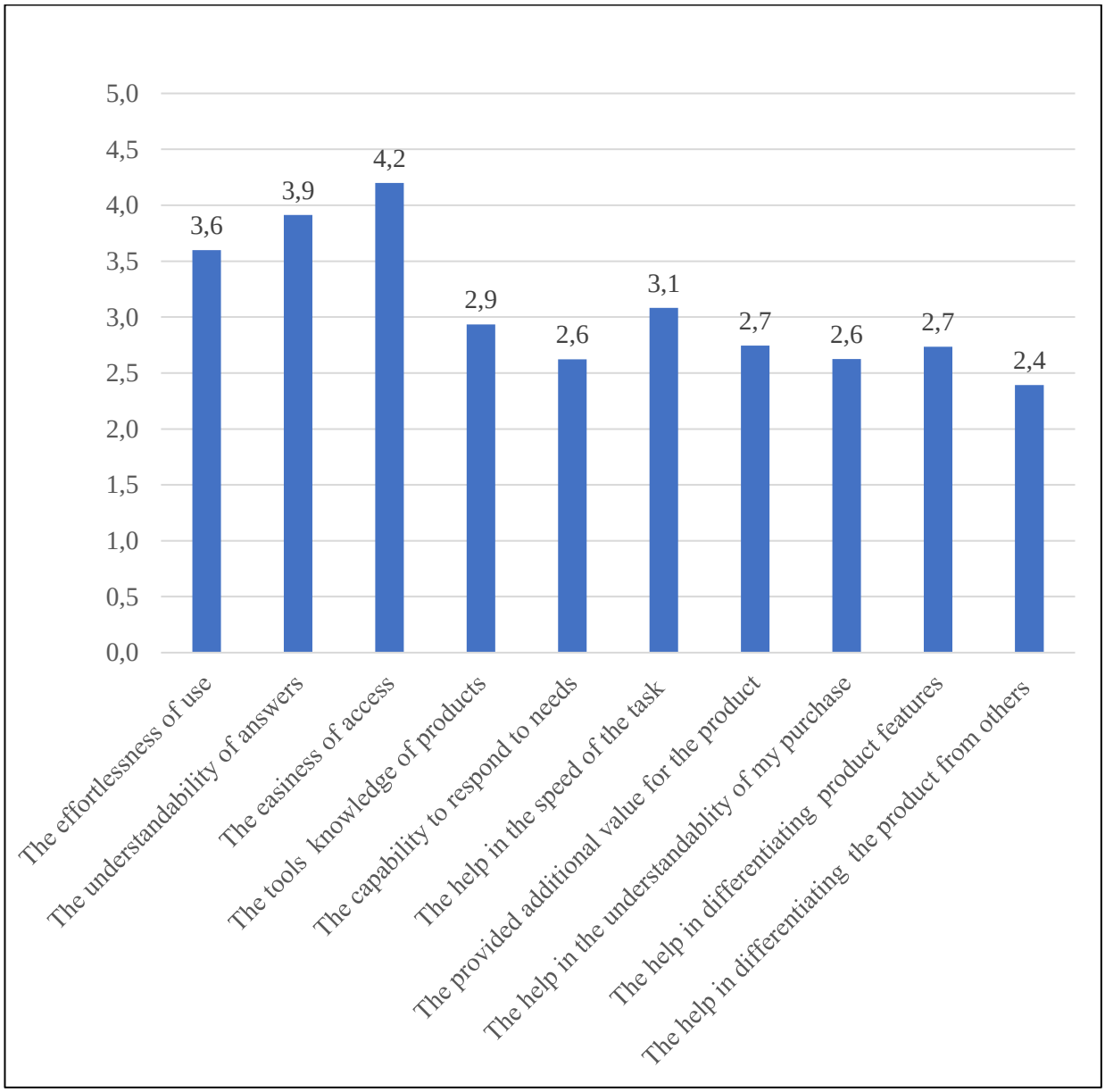

Figure 5. Mean values concerning the use of the virtual assistant tools (n = 54)
Source: the author

The distribution of the answers to all questions was also analyzed. Most respondents agreed or strongly agreed with ease of use. The answers concerning perceived usefulness and perceived value were more evenly distributed (Figure 6).

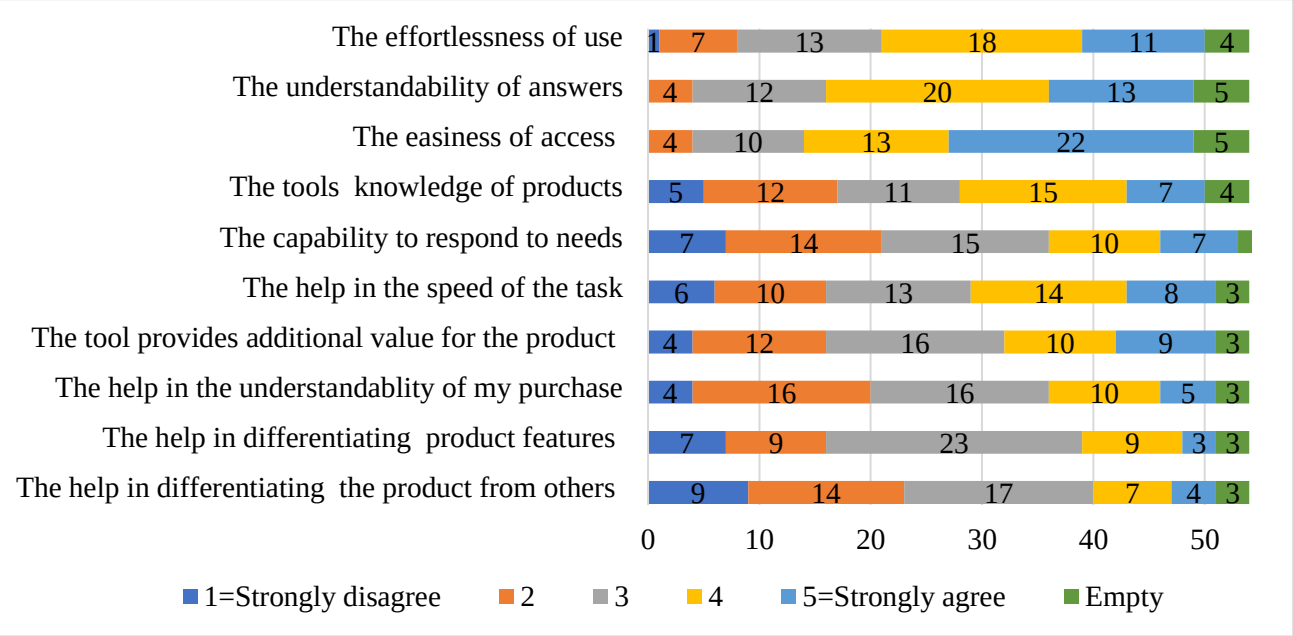

Figure 6. Distributions of answers to all questions concerning the use of the virtual assistant tools (n = 54)
Source: the author

Less than 20% (n = 10) of all respondents felt confident enough to buy the product without seeing it in person. However, the overall experience of the tool was either neutral (n = 20) or above (n = 24) in over 80% of the answers (Figure 7).

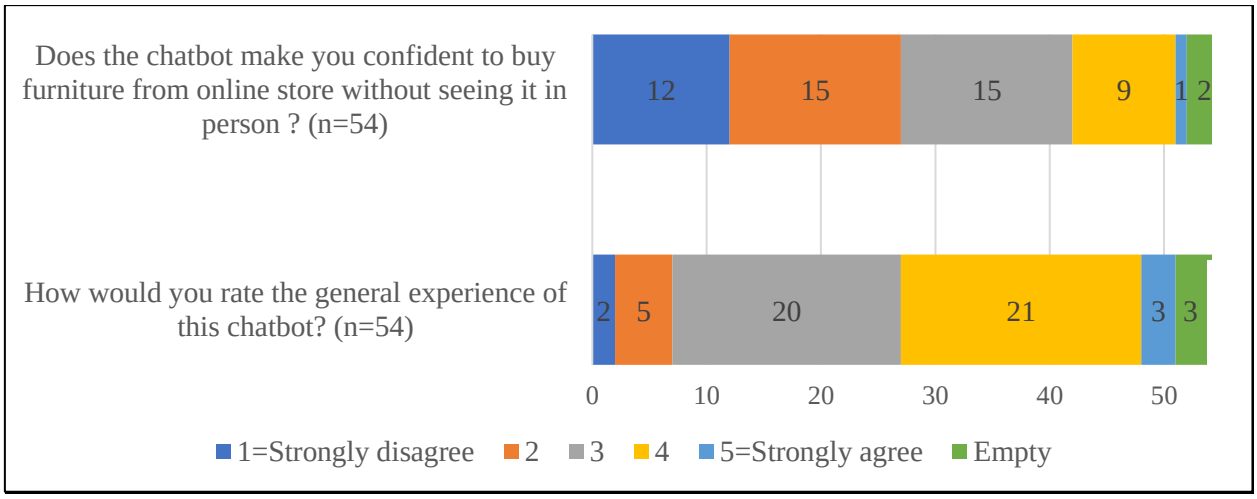

Figure 7. Distributions of answers concerning confidence gained and the overall experience with the tool (n = 54)
Source: the author

The author also compared the answers given by the male and female respondents under and over 30 years of age to determine the differences between these categories. Potential correlations between these variables and the answers were also analyzed.

Respondents under 30 years of age considered the perceived usefulness of the tool to be significantly higher (3.67 vs. 2.78, $p = 0.042$). Although younger respondents also used a VA tool more often, it was not significant ($p = 0.071$). There was no difference in perceived confidence in buying furniture without seeing if or in the general experience of the tool. Five respondents did not provide information about their ages, which were missing from the analysis.

The female respondents considered that the tool was easier to use, and the perceived value was higher, but the differences were not significant. No difference was detected between perceived confidence and general experience. The correlation between the respondents' age and gender and the three dimensions was weak (Table 2).

The differences among the VA tools were studied using the Kruskal–Wallis test. A statistically significant difference between the different tools was found only in the understandability of the tool ($p = 0.04$). Finnsoffa's VA tool was considered the best. After the comparison in groups of two based on the Mann–Whitney U-test and the Bonferroni adjustment, the difference no longer showed significance.

Table 2. Results for the three dimensions according to respondents' ages and gender.
Source: the author

Age	**Under 30 years (n = 28)**	**Over 30 years (n = 21)**	***p*-value**	**Spearman correlation**	**Male**	**Female**	***p*-value**	**Spearman correlation**
Ease of use (mean ± SD)	4.33 (±0.65)	4.00 (±0.93)	0.40	0.134	3.88 (±0.84)	4.44 (±0.73)	0.158	-0.190
Perceived usefulness (mean ± SD)	3.67 (±1.30)	2.78 (±0.75)	0.042	0.313*	3.22 (±1.09)	3.13 (±1.36)	0.874	-0.276
Perceived value (mean ±SD)	2.94 (±1.08)	2.73 (±0.89)	0.545	0.178	2.67 (±0.99)	3.50 (±1.92)	0.457	-0.175
How many times per month do you use the retail chatbot?	1.88 (±1.41)	1.00 (±1.38)	0.071	0.487**	1.52 (±1.7)	1.30 (±0.82)	0.618	-0.140
Does the chatbot make you confident to buy furniture without seeing it?	2.57 (±1.12)	2.26 (±1.06)	0.333	0.187	2.21 (±1.10)	2.80 (±0.94)	0.076	-0.259
How would you rate the general experience of this chatbot?	3.45 (±0.95)	3.19 (±0.83)	0.265	0.183	3.07 (±0.94)	3.73 (±0.70)	0.013	-0.335

Note. *significance at level 0.05, **significance at level 0.01

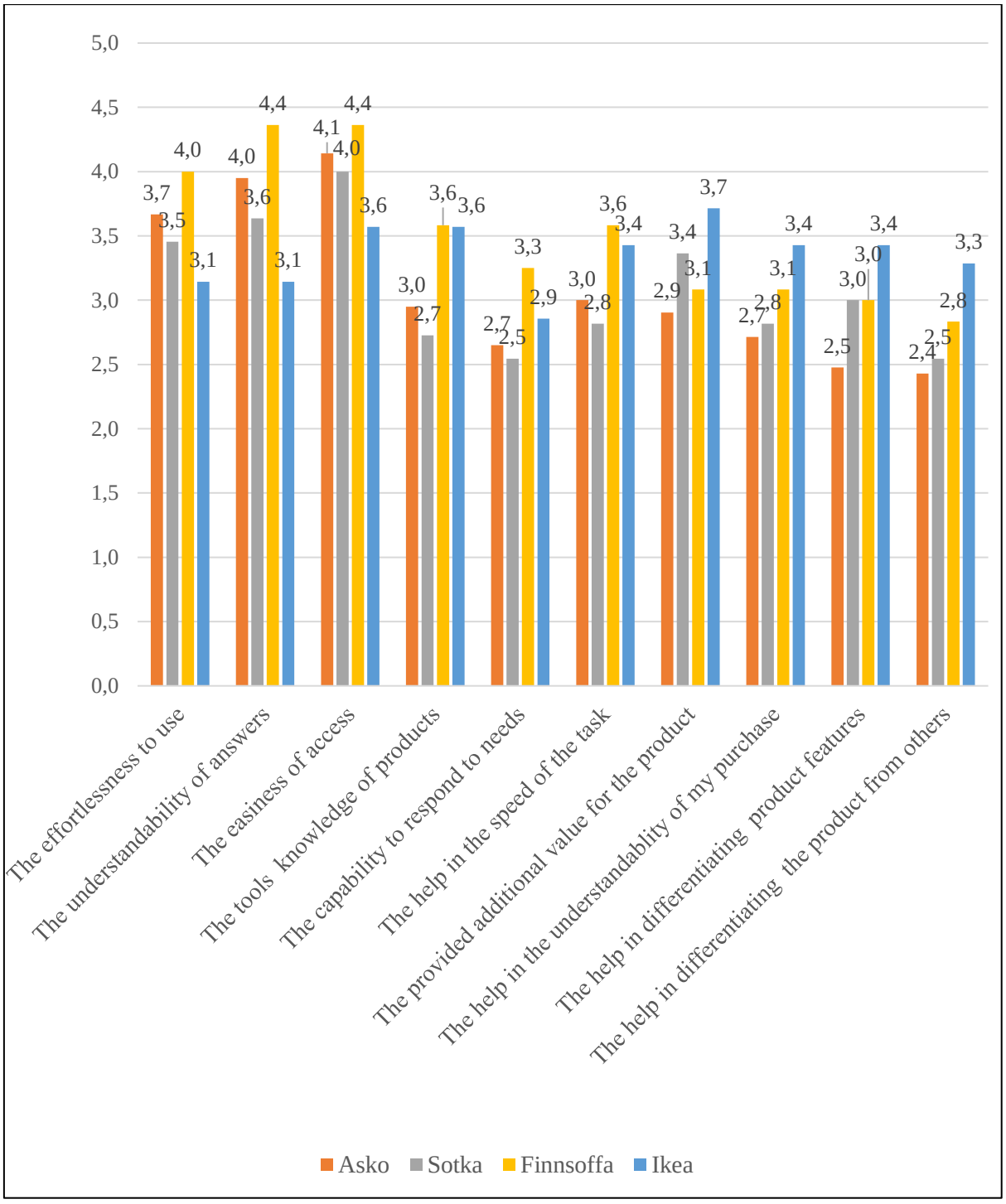

Figure 8. Comparison of mean values of the tools
Source: the author

The analysis of different AI-tools showed that the differences between the tools were quite small. However, the FinnSoffa -app was consider most effortless (4.0) to use and access (4.4) and the answers most understandable (4.4). The IKEA -tool was consider the best to provide additional value (3.7) for the product, help in understandability (3.4) of the purchase and in differentiating

the product from others (3.3). The highest mean values were given to the easiness of access (3.6-4.4), but the tool were also considered quite effortless to use (3.1-4.0, mean) and the answers given by the tool understandable (3.1-4.4, mean) (Figure 8).

Approximately 40% (n = 20) of the respondents felt confident enough to buy the product without seeing it in person. However, the experience concerning the use of the tool was neutral among 34 % of the respondents (n = 20), while 47% (n =23) considered the experience positive (Figure 9).

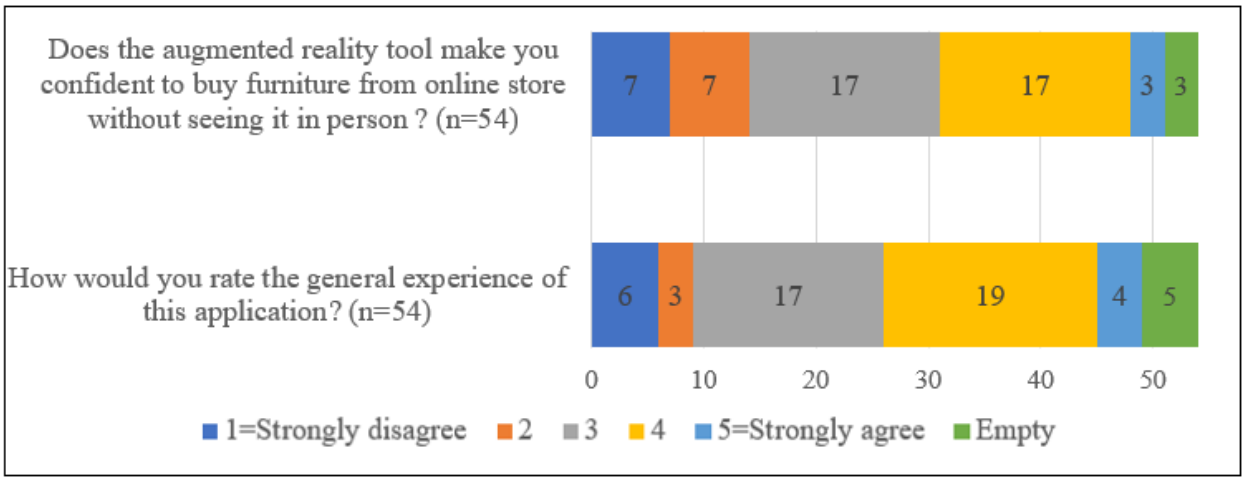

Figure 9. Overall confidence and experience after using the augmented reality application
Source: the author

The analysis of the respondents' responses associated with the use of the Ikea Place AR tool showed that all three dimensions remained neutral. The highest mean value (3.5) was given to ease of use, followed by perceived usefulness (2.9), and perceived value (3.1); otherwise, the tool was neither favored nor disfavored (Figure 10).

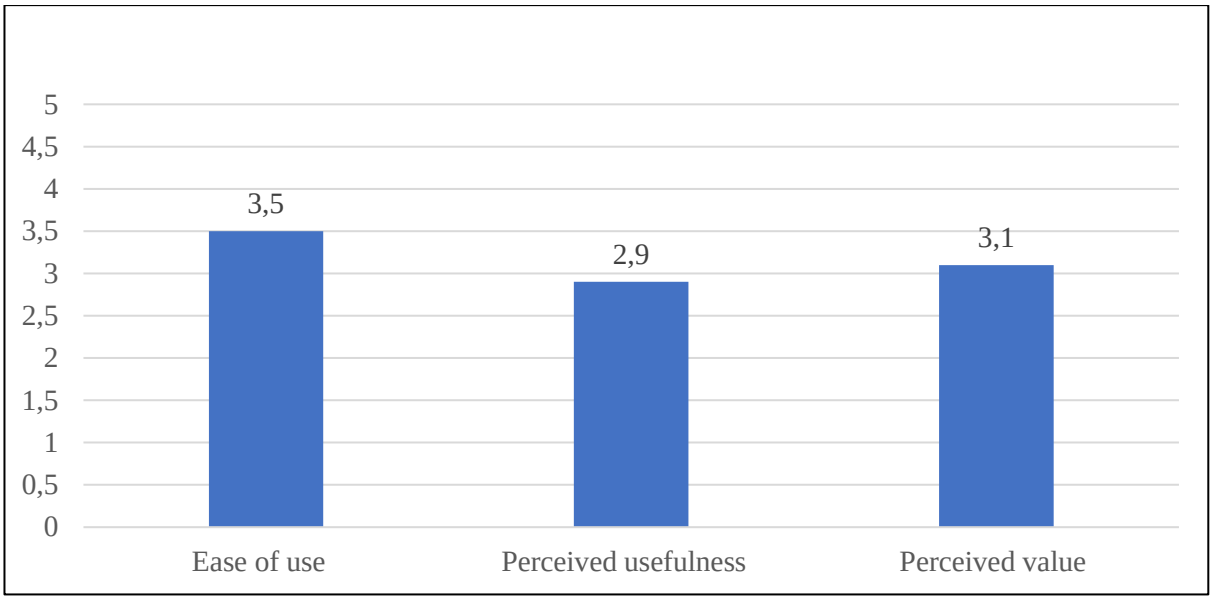

Figure 10. Mean values associated with the use of the Ikea place AR tool and based on the three dimensions (n = 54)
Source: the author

Regarding the VA tools, the analysis of answers to questions concerning the use of the Ikea Place AR tool also showed that the ease of the tool had the highest mean value (4.0). The answers to the other questions concerning ease of use—effortlessness (3.1) and understandability of answers (3.3)—remained neutral. The results showed that perceived usefulness neither agreed nor disagreed with the mean values concerning the tool's knowledge of the product, its ability to meet the respondents' needs, and its help in speeding the purchase at 3.0, 2.9, and 3.0, respectively. In addition, the responses concerning perceived values remained neutral. The mean values of the responses concerning perceived additional value, the tool's help in understanding the intended purchase, and the ability of the tool to differentiate the product's features or differences from other products in the market were 3.2, 2.9, 3.1, and 3.0, respectively (Figure 11).

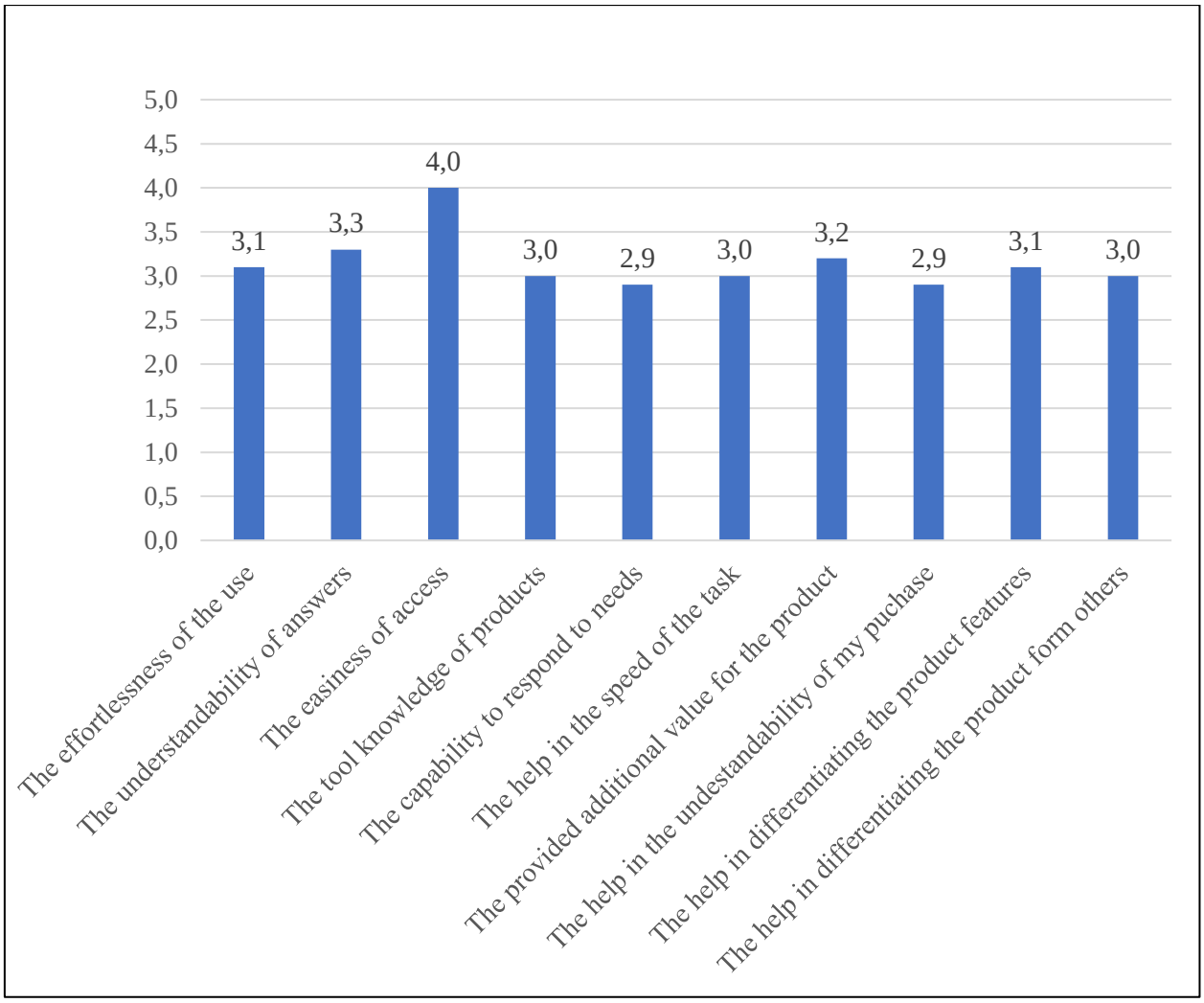

Figure 11. Mean values concerning the use of the virtual assistant tools (n = 54)
Source: the author

The results showed that 67% of the respondents either agreed (n = 18) or strongly agreed (n = 18) that the tool was easy to use. The effortlessness of use and the understandability of the tool's answers were agreed upon or strongly agreed by 35% (n = 19) and 44% (n = 24) of the respondents. The answers concerning perceived usefulness and perceived value were more distributed, and approximately 30% of the respondents neither agreed nor disagreed. The tool's ability to respond to the needs of the respondents was not supported by 30% of the respondents (n = 17). According to 30% of the respondents (n = 16), the tool did not provide a better understanding of the product of interest (Figure 12).

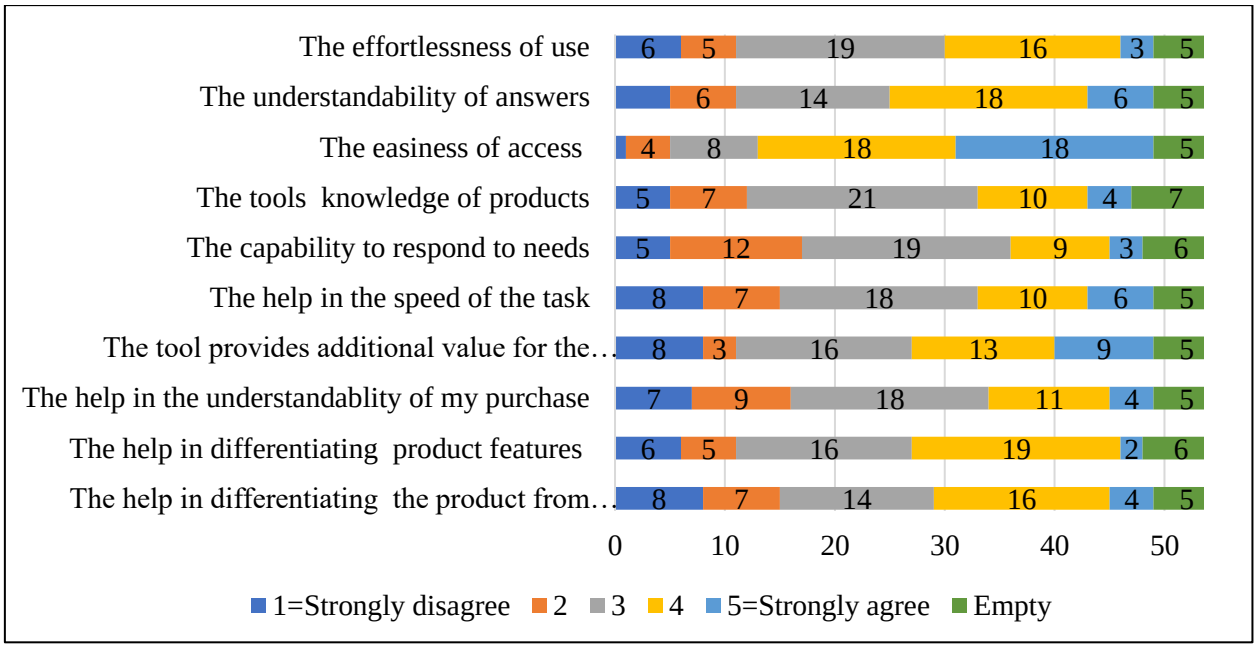

Figure 12. Distribution of answers concerning the use of IKEA Please tool (n = 54)
Source: the author

Finally, the author also compared the answers given by the male and female respondents under and over 30 years of age. Possible correlations between these variables were analyzed and between the characteristics and the answers were also analyzed.

Compared with respondents over 30 years of age, respondents under 30 years of age considered the tool easier to use (3.45 vs. 3.19, p = 0.265). However, respondents over 30 years of age considered perceived usefulness (3.00 vs. 3.45, p = 0.493) and perceived value (2.13 vs. 3.45, p = 0.027) higher. Only the difference in the perceived value reached significance. Respondents under 30 years of age reported using an AR tool significantly more often (2.00 vs. 3.45, p = 0.012), but no difference was found in the amount of confidence gained (1.22 vs. 2.00, p = 0.557) and general experience (2.68 vs. 3.30, p = 0.087). The male respondents considered the tool easier to use (3.49 vs. 3.11, p = 0.260), but perceived usefulness (2.74 vs. 2.78, p = 0.927) and perceived value (2.98 vs. 2.70, p = 0.449) were equal. The reported frequency of the use of the AR tool (1.15 vs. 0.38, p = 0.175) and confidence gained (3.14 vs. 2.79, p = 0.362) were equal between the groups (Table 3).

Table 3. Correlations between age and gender concerning the IKEA Place -tool (n=54) Source: the author

Age	**Under 30 years (n = 28)**	**Over 30 years (n = 21)**	***p*-value**	**Spearman correlation**	**Male**	**Female**	***p*-value**	**Spearman correlation**
Ease of use, mean (±SD)	3.45 (±0.95)	3.19 (±0.83)	0.265	0.183	3.49 (±0.88)	3.11 .(±1.07)	0.260	-0.335
Perceived usefulness, Mean (±SD)	3.00 (±1.41)	3.45 (±0.82)	0.493	0.034	2.74 (±0.80)	2.78 (±1.20)	0.927	0.494*
Perceived value, mean (±SD)	2.13 (±1.25)	3.45 (±0.90)	0.027	-0.349	2.98 (±0.96)	2.70 (±1.17)	0.449	0.266
Approximately, how many times in a month you use augmented reality applications?	2.00 (±1.23)	3.45 (±1.04)	0.012	-0.437	1.15 (±2.69)	0.385 (±0.65)	0.175	0.534*
Does the augmented reality tool make you confident to buy furniture from online store without seeing it in person?	1.22 (±2.44)	2.00 (±6.08)	0.557	-0.076	3.14 (±1.15)	2.79 (±1.19)	0.362	0.308*
How would you rate the general experience of this application?	2.68 (±1.20)	3.30 (±1.10)	0.087	-0.269	3.37 (±0.92)	2.57 (±1.28)	0.052	0.167

Note. *significance at level 0.05, **significance at level 0.01

In conclusion, the overall experience of the male respondents was higher (3.37 vs. 2.57, $p = 0.052$), which was close to statistical significance. However, the correlations between age and gender and the studied dimensions were weak (Table 3).

4. DISCUSSION

In this study, the author analyzed the previously presented three dimensions and their effects on CE regarding the ease of use, perceived usefulness, and perceived value of utilizing selected VA and AR tools. The experiences of users were analyzed to determine whether the use of these tools could positively enhance CE. Additionally, the demographics of the users and their possible associations with CE were analyzed.

According to Davis (1989), the ease of using AI technologies plays a significant role in accepting new technologies. As the results of the analysis of the responses to the online questionnaire showed, ease of use was the most valued of the three dimensions and was rated more highly than perceived usefulness and value. Based on these findings, it can be concluded that modern technology can provide easy-to-use AI tools for customers, thereby positively affecting their acceptance of these tools and CE.

Regarding ease of use, the results showed that ease of accessibility via the respondent's internet-connected device had the highest value. In addition, the responses concerning the overall ease of use and the understandability of the tool's answers were rated positively by the respondents. The results showed that the use of the Ikea Place tool was considered slightly more difficult compared with the chatbots (3.5 vs. 3.9).

As revealed in the literature review, these tools are practical only to the extent that a person or machine can process the given information (Roggeveen et al., 2020). Additionally, according to Venkatesh et al. (2011), in implementing AI technology, customers expect to receive real-time and personalized information. Considering the diversity of customer characteristics, these requirements can be considered more difficult to fulfill. The findings from the analysis of the responses to the questionnaire partially support the findings of previous studies. In the present study, the ratings concerning VA- and AR-associated perceived usefulness remained neutral. The

results showed that 44% of the respondents “agreed” or “strongly agreed” that the VA tool had extensive knowledge about their product; 22% gave a neutral answer. In contrast, 42% of the respondents “disagreed” or “strongly disagreed” with the ability of the tool to respond to their informational needs. A neutral answer was given by 30% of the respondents.

Romano et al.’s (2022) study on the practicality of the Ikea Place AR tool indicated that the use of this application was associated with an increase in the confidence and quality evaluations of customers. In comparison, the results of this study were neutral. The average ratings of the usefulness of the AR tool were only slightly above the neutral level.

In this study, the ratings of the perceived value of the use of VA and AR tools remained neutral. Luo et al. (2019) concluded that, in implementing VA tools, it is essential for the company to know and understand the importance of essential information from the customer. As stated previously, this places higher requirements on the tools used, as the interactions of customers with the tools may be similar to human-to-human conversations. In contrast, Hilken et al. (2020) and Adam & Pecorelli (2018) found that AR tools positively affected customer’s purchase intentions by adding the gained information while they used the tools.

This study also analyzed the effects of demographic variables on the results. Regarding ease of use, the difference between men and women remained insignificant. However, women considered effortlessness of use, ease of access, and additional value of the VA tool better. In line with previous studies, the men and women in the present study processed the given information differently (Ladhari & Leclarc, 2013). In line with Gligor et al. (2022), the results of this study showed that gender influenced CE and customers’ actions. Based on this finding, customers’ gender needs to be considered in developing AI-based marketing. Maggioni et al. (2020) found that demographics can affect attitudes toward technological tools. A comparison of different statistical methods showed that men reported the use of the AR tool as significantly easier, and the tool also helped them differentiate a product from others. The differing results concerning the effect of gender in this study could have been due to the small sample size.

What are the effects of these tools on the furniture industry? The proper implementation of these tools can be viewed as practical, as they offer highly personalized content in an accessible form. Most products provided by the furniture industry are likely to be valued differently by different individuals, as the design, mobility of the product, price, and customer characteristics strongly

affect CE. As furniture industry items can be difficult to mobilize, the use of an AR tool could, in theory, strongly guide customers through their purchase experiences and decisions. In this study, three different VA tools and one AR tool were chosen to be tested in the questionnaire. All the tools used in the questionnaire were provided by various furniture companies.

The three dimensions explored in the questionnaire were based on the findings of the literature review. This research aimed to determine how these dimensions were viewed by the respondents and the ways in which they influenced CE. Although they seemed easy to use, they did not seem to significantly give additional value to the user in deciding on the purchase. As described previously, CE is a multidimensional concept, and other dimensions may also play important roles in final purchase decisions. Future research should aim to determine which tool is the most influential. In addition, research about the subject could provide companies with practical methods for implementing these tools and the limitations that should be considered.

Based on the results of the present study, several factors should be considered in implementing VA and AR tools. First, as the results of the analysis of the responses to the online questionnaire indicated, the respondents considered the VA and AR tools easy to use and accessible. Based on these results, the functionality of the technology is sufficient. Second, the findings indicated that the perceived usefulness of these tools was neutral. The respondents sought more detailed information and understanding using the tools. Furthermore, the tools did not help accomplish the task of making a quick purchase. In the future, these parameters should be researched in more detail to provide more useful experiences for customers. Third, the perceived value of using the tools was not significant. Future research should examine this dimension in detail. Many users reported some difficulties using the tools. In addition, none of the devices was compatible with the tool used.

In researching any of the three dimensions, customer demographics should be considered because approaches and attitudes toward these tools can differ according to age, gender, and country of residence. A deeper understanding of the demographics associated with the use of these tools can create a more customer-segmented experience.

A limitation of this study is the small sample size. Therefore, the results may not statistically represent the true differences between the respondents. . In addition, it should be noted that the author selected the sample used in the study, which may not truly represent the general population.

Also, these results indicate only the experiences that the respondents had according to four different chatbots and one AR application. Thus, the results cannot be interpreted as representing all AR and VA tools in the furniture industry. However, the sample represented a wide variety of ages and respondents from three countries. Since this study focused on the experience of consumers, furniture industry representatives were not included in the study..

CONCLUSION

The goal of this research was to determine the association between virtual assistant (VA) and augmented reality (AR) tools in the furniture industry. The advancement and complexity of modern marketing tools can affect customer engagement (CE). The main research problem of this thesis was the lack of knowledge in companies about the factors that affect CE in the furniture industry regarding the use of modern marketing tools. To fill the research gap in the literature, this study examined the effects of using VA and AR tools in the furniture industry as well as their added values across three dimensions: perceived ease of use, perceived usefulness, and perceived value.

This study aimed to answer two research questions: RQ1: What is the impact of VA and AR tools on CE in the furniture industry? RQ2: What are the strengths and weaknesses of VA and AR tools? Regarding RQ1, the results indicated that the information provided by the tools had little to no effect on the respondents. However, as the general opinion concerning usefulness and value was neutral, it can be assumed that these tools can offer a concrete platform for building customer relationships in the future. Regarding RQ2, the results showed that the strengths of the VA and AR tools were more or less based on their user-friendliness. In this study, the respondents valued ease of access over the other dimensions. The weakness of the VA and AR tools was that the quality of the information presented to the user was not sufficient to keep the customer actively engaged with the technology.

Regarding the validity of the data, it should be noted that the sampling method and sample size were limited. Thus, as previously mentioned, the study sample does not represent any given population. During the research process, the author was surprised by the primary data collected. The results did not meet his original expectations or those of prior research on the subject. Even though the findings are marginally contradictory, this research adds new knowledge to the existing literature and highlights the research gaps in the literature. The findings of the study performed for

this thesis indicate that the use of these marketing tools is new, both in the literature and by customers.

The author provides the following suggestions for companies in the field:

1. New tools that are implemented should provide practical information and value to customers.
2. To better contrast the usefulness of such tools, they should be easily accessible and usable.

For future research, the author suggests the following: 1) the determinants that make these tools easy to use should be further discovered and examined; 2) further research should be conducted on different dimensions and their effects; and 3) research on the organizational values these tools provide should be conducted.

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APPENDIX

The online questionnaire and results (n=54)

The Use of Augmented Reality and Virtual Assistants in the Furniture Industry

My name is Matias Kaijomaa, and I am currently studying for a bachelor's degree in business and marketing. I am conducting this survey to collect data for my thesis project.

This survey consisted of questions regarding virtual assistants and augmented reality tools in the furniture industry. Please answer according to your personal experience.

All answers submitted on this form will be received **anonymously** to ensure the privacy of the respondents. During this survey, I will ask you to try one virtual assistant and an augmented reality application.

1. Virtual Assistants is a program designed to understand the needs of users and reply with relevant information.

2. Augmented reality is a form of technology that allows for the overlay of digitally created visuals on real-world scenarios, creating immersive and close-to-realistic experiences.

Demographic Information		**Number**
Gender	Male	28
	Female	17
	Unkown	9
Age	an open field question	
Country	an open field question	

Please try a chatbot.

Shortly after you open the link, you should see a chat icon on the bottom right of your device.
For the purpose of this survey, engage in a comprehensive conversation as a regular customer would. You can ask about products, return policies, and services.

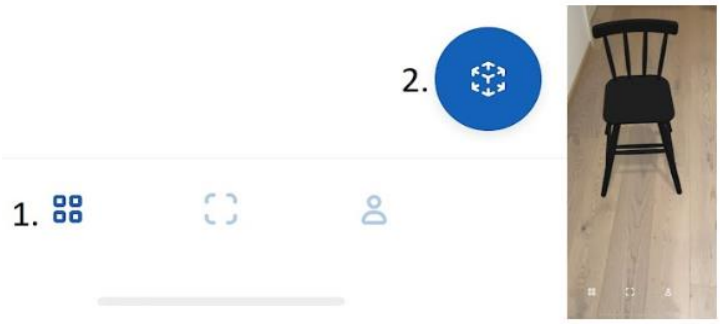
Questions regarding ease of use	**1.Strongly disagree (n)**	**2**	**3**	**4**	**5.Strongly agree (n)**
The tool felt effortless to use.	1	7	13	18	11
The responses from the tool were easily understandable.	0	4	12	20	13
The tool was easy to access using my internet-connected device.	0	4	10	13	22
Questions regarding perceived usefulness					
The tool has extensive knowledge about products.	5	12	11	15	7
The tool is capable of responding to all of my information needs.	7	14	15	10	7
The tool helped me to accomplish a task quicker than a customer representative would.	6	10	13	14	8
Questions regarding perceived value					
The tool provides additional value for the product.	4	12	16	10	9
The tool helped me to better understand what I am buying.	4	16	16	10	5
The tools helped me to understand the different features a product.	7	9	23	9	3
The tool helps me to differentiate the product from other product on the market.	9	14	17	7	4
Does the chatbot make you confident to buy furniture from online store without seeing it in person?	12	15	15	9	1
How would you rate the general experience of this chatbot?	2	5	20	21	3
Approximately, how many times in a month do you use retail chatbots?	An open field question				

Please take a minute to try out an **augmented reality** application.
You can find it from the following links based on your operating system:
Apple Store
Google Play

When the application is installed, proceed with the following steps:

1. On the bottom left of your device, you should find the following icon (shown below). A list of various products should appear. Choose a product you want to try.
2. Proceed by pressing the icon and pointing your device to the area where you would like to place the product.
3. When confirmed, the product should now be added to your surroundings.

You can proceed to examine the product from different angles and perspectives.



Questions regarding ease of use	**1.Strongly disagree (n)**				**1.Strongly agree (n)**
The application felt effortless to use.	6	5	19	16	3
The application was easy to use.	5	6	14	18	6
The applications was easy to access using my internet-connected device.	1	4	8	18	18
Questions regarding perceived usefulness					
The application contains extensive knowledge about the product.	5	7	21	10	4
The application responds to all of my informational needs.	5	12	19	9	3
The application helped me to accomplish a task quicker than a customer representative.	8	7	18	10	6
Questions regarding perceived value					

The application provides additional value for the product.	8	3	16	13	9
The application helped me to better understand the quality and value of the products.	7	9	18	11	4
The application helped me to understand different features in the product.	6	5	16	19	2
The tool helps me to differentiate the product from other product on the market.	8	7	14	16	4
Approximately how many times in a month you use augmented reality applications?	an open field question				
	1.Strongly disagree (n)	**2**	**3**	**4**	**5.Strongly agree (n)**
Does the augmented reality tool make you confident to buy furniture from online store without seeing it in person-?	7	7	17	17	3
How would you rate the general experience with this assistant?	6	3	17	19	4
Any optional comments about these tools?	An open field question				

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