

# The influence of Augmented Reality on Customers' technological Anxiety, Perceived Information Quality and Purchase Intention

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## **Abstract**

This study examines the effect augmented reality instructional videos have on purchase intention through two different paths: the path of perceived information quality and the path of technology anxiety. Additionally, the study examines the effect of interaction between augmented reality and online purchase frequency on perceived information quality and technology anxiety. To explore these connections, the author conducts a survey-based experiment with two conditions: one where subjects see a traditional instructional video and another where subjects see an augmented reality instructional video. The findings of this study show that augmented reality significantly affects perceived information quality alone and when there is an interaction between augmented reality and online purchase frequency. The author finds the effect of perceived information quality to be significant but negative, which is the opposite of what the paper firstly proposed. When it comes to the path of technology anxiety, the findings show that augmented reality increases technology anxiety, but technology anxiety does not have a significant effect on purchase intention.

*Keywords: augmented reality; instructional video; technology anxiety; perceived information quality.*

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## **1. Introduction**

### **1.1. Problem Statement and Research Questions**

The intensive growth of technology has changed how marketers communicate with customers and the role of the customer in product advertising. Intensive use of the internet as a medium resulted in 2021 being the record year for digital advertising spending worldwide, with expected growth in 2022 (Forbes, 2021). There are several ways to influence customers on the internet through different media, one of them being video content. Harvard media stated that YouTube is the second biggest search engine on the internet and that over 1 billion hours of video are being watched daily on this platform. According to research conducted by Wyzowl, out of 582 surveyed companies, 86% use video as a marketing tool (HubSpot 2022). The mentioned survey shows that marketers most commonly use explainer videos. Moreover, Google trends indicate that the term "how to" had a search volume index of 94 on YouTube in December 2021 (Google trends, 2022).

As the internet becomes a big part of our everyday life, there are more and more ways to bring value to the customer using technologies such as virtual reality and augmented reality. For example, during the COVID -19 pandemic, retail brands have invested in augmented reality to ensure that customers can experience the product in the similar way they would in a physical store. The fact that research has predicted that augmented reality will have 1.73 billion users worldwide by 2024 (Statista 2021) shows the importance of this technology as a marketing tool. The goal of the research is to combine video with augmented reality and answer how the implementation of augmented reality in instructional videos affects the customers and their intent to purchase.

### **1.2. Academic Relevance**

This research contributes to the existing literature from three different points of view. Firstly, the paper expands the current literature about augmented reality by researching a new tool marketers use. There have been numerous studies focused on comparing the traditional advertisement to augmented reality advertisement, with a focus on different conditions such as brand knowledge (Pozharliev et al., 2022), and spatial presence (Hilken et al., 2017) or vividness and interactivity (Yim et al., 2017). These studies examined the

roles of different factors that affected e-commerce augmented reality. While all of them provide useful information on how such technology affects the customer, they all concentrate only on e-commerce, not taking into account any other tool marketers may use to reach customers, such as video. By merging instructional video with augmented reality, this paper explores the effect augmented reality has on customers through video, therefore adding to the current discussion on traditional opposed to augmented reality advertisement.

Secondly, this paper contributes to the existing literature about video as a marketing tool by exploring the use of instructional video as a form of marketing communication. Current literature about the role of video in marketing has only focused on short advertisement videos, and their effect on customers (Belanche et al., 2016) as well as the emotions video advertisement arouse in consumers (Teixeira et al., 2012). The literature has not investigated how customers perceive the instructional video and whether they find it beneficial when it comes to their intent to purchase or not.

Lastly, this paper contributes to the existing literature by considering the backfiring effect augmented reality can have on the customer by providing the process view of customers' both positive and negative perceptions. Prior literature has explored how augmented reality as technology impacts customers, considering different factors such as anthropomorphism (Van Esch et al., 2019) or sensory aspects (Heller et al., 2019). Previous literature has focused on the technological point of view, not considering the customer's perspective of the technology. The present study extends the existing literature by exploring the negative impact the technology may have on consumer behavior.

### **1.3. Managerial Relevance**

As augmented reality has already shown its impact on increasing purchases, managers tend to find more effective ways to use it in future communication with consumers. This research is relevant for marketing managers in three particular ways.

Initially, this research could help managers looking for an advanced way to drive purchase intention with innovative technology. The findings of this study help managers acknowledge if customers find the concept of augmented reality instructional video more effective in comparison to the traditional form of instructional video and if the investment in such technology would benefit them.

Additionally, if we take into account that some customers are still not familiar with augmented reality, managers have to distinguish which customers to target with this technology. This research offers managers information about what customers would benefit from videos based on augmented reality, taking into account how frequently the potential customers shop online.

Finally, this research helps managers learn about the process a customer goes through when using technology such as augmented reality. By learning about this process, managers learn how to strengthen the positive effect the technology can have and mitigate the negative ones.

## **2. Literature Review**

The following literature review presents a summary of the articles relevant to this study to provide a clear understanding of the researched topic. This research relates to two themes: augmented reality and consumer behavior.

### **2.1. Augmented reality (AR)**

Augmented reality is a technology that shows digital objects in real-life space and therefore creates a new perception of reality through the usage of camera capabilities to recognize objects and position them correctly (Tan et al., 2022). This technology has been the topic of numerous research in the field of marketing, with a focus on the influence of augmented reality on e-commerce. Table 1 shows a brief summary of the most relevant papers on this topic.

Yim et al. (2017) discuss the effectiveness of augmented reality in e-commerce, comparing the effect of this technology with traditional e-commerce when it comes to customer evaluations and how factors such as novelty, immersion, media usefulness, media enjoyment, attitude toward the medium, and purchase intention change depending on the e-commerce media type. This research sheds light on the consumers' perception of augmented reality as an alternative to traditional media types such as photos or video. Moreover, another important research about the difference between the impact of augmented reality and traditional media is that by Tan et al. (2022). This paper focuses on the effect of augmented reality on retail sales based on product knowledge and prior use



of technology. It is of great importance, as it gives information about what type of products customers prefer to see in augmented reality compared to photos or video.

Van Esch et al. (2019) study the technology itself and what factors specific to this technology influence customers. Through an experimental study, this research explores the humanization of augmented reality technology and what aspect of humanization has an effect on the customers' perspective of the brand that uses augmented reality technology. The second critical study about the technological elements of augmented reality is that by Heller et al. (2019). This study focuses on the multi-sensory aspect of augmented reality, and the influence technology can have on purchase intention. Both papers are crucial to understanding how customers feel about the specifics of this technology.

Pozharliev et al. (2022) explore the influence psychological factors of augmented reality have on consumer behavior. Through an experimental study, this paper researches the effect of the arousal caused by augmented reality on consumer behavior. Another paper that explores consumer behavior is Hilken et al. (2017). This paper explores the effect of augmented reality on information processing and privacy concerns. These two papers are of great importance as they help explain the positive influence of augmented reality on consumer behavior.

## **2.2. Consumer behavior**

Consumer behavior studies how customers make decisions when purchasing products or services (Huang et al., 2009). This process is essential for marketers as it helps explain how a customer will react to specific stimuli so that they can learn what stimuli are best in which situation. Table 2 shows a brief summary of the most relevant papers on different stimuli and their effect on consumer behavior.

Belanche et al. (2017) explore how high-arousal stimuli affect customers regarding the skippable video advertisement. The research focuses on the moderating effect of context congruency and product involvement. Moreover, Teixeira et al. (2012) investigate how video stimuli leads to emotions such as joy or surprise and how these emotions influence consumer behavior. Both papers provide a clear insight into how video advertisements as stimuli affect information processing, therefore making a good basis for this thesis.

Kim et al. (2008) researches the consumer attitude toward the usage of the virtual try-on through the E-technology acceptance model. This paper is of significant importance for the research of this study, as it introduces technology anxiety as one of the moderators and explains the effect it could have on consumer behavior.

Kim & Niehm (2009) explores how the quality of a website affects perceived information quality, perceived value, and loyalty intentions through a variety of factors that affect website quality. Through this research, the authors acknowledge that perceived information quality positively effects perceived value and that consumers perceive products with higher information quality as a better value for money. Moreover, Gan & Wang (2017) explore the influence perceived value has on purchase intention. These two studies are of great importance for current research as together, they provide information about the correlation between perceived information quality and purchase intention.

**Table 1: Augmented reality literature review**

Author/Date	Context	Methodology	Conclusions	Variables of focus
<b>Heller et al. (2019)</b>	The connection between multi-sensory AR as an active interference and mental intangibility and decision comfort. Does this connection lead to purchase intention?	4 Studies conducted among 489 undergraduate students	Touch control has a negative effect on mental intangibility. Touch control and decision comfort positively affect willingness to pay. Mental intangibility negatively predicts decision comfort.	<ul style="list-style-type: none"> <li>• Mental intangibility</li> <li>• Decision comfort</li> <li>• Willingness to pay</li> <li>• Sensory control</li> <li>• Sensory feedback</li> <li>• Assessment</li> </ul>
<b>Hilken et al. (2017)</b>	The effectiveness of AR on customer behavior intentions through utilitarian and hedonic perceptions. The effect depends on customer information processing and privacy concerns.	4 studies conducted among 838 students aged from 16 to 31	AR has a positive effect on utilitarian and hedonic perceptions through simulated physical control and environmental embedding. This effect exists because the customers feel that AR provides a feeling of spatial presence, which positively affect decision comfort. Yet, this positive effect is lower when customers have privacy concerns.	<ul style="list-style-type: none"> <li>• Simulated physical control</li> <li>• Environmental embedding</li> <li>• Spatial presence</li> <li>• Hedonic value</li> <li>• Utilitarian value</li> <li>• Willingness to pay</li> </ul>
<b>Pozharliev et al. (2022)</b>	The difference in the impact of self-reported measures of arousal compared to the real-time psychological measure of arousal concerning AR when predicting customer behavior.	2 studies conducted among 110 students	Psychological measured arousal is effective when it comes to predicting consumer behavior connected to AR products Self-reported intensity is higher in AR as opposed to the traditional advertisement, but there is no difference in willingness to pay	<ul style="list-style-type: none"> <li>• Galvanic skin response</li> <li>• Affect intensity</li> <li>• Willingness to pay</li> <li>• Traditional vs. AR</li> </ul>
<b>Tan et al. (2022)</b>	The effect of AR on product evaluation regarding sales. Do sales based on AR presentation vary based on product characteristics? The influence of prior experience with the channel and product on sales.	Secondary data, collected from an online brand Analysis of customer reviews	AR has a high effect on less popular brands or products. AR might not have such an increased effect on performance uncertainty. AR has more impact on sales when it comes to customers that are new to the online channel or the product.	<ul style="list-style-type: none"> <li>• Brand popularity</li> <li>• Product appeal</li> <li>• Product rating</li> <li>• Sales</li> </ul>
<b>Van Esch et al. (2019)</b>	The influence the humanization of technology can have on customers' perception of AR and the brand using the technology.	1 study conducted among 319 shoppers	Anthropomorphism has a positive effect on consumers' confidence in AR. Anthropomorphism has a positive impact on consumers' perception of the innovativeness of AR.	<ul style="list-style-type: none"> <li>• Anthropomorphism</li> <li>• Confidence</li> <li>• Transaction convenience</li> <li>• Discomfort</li> <li>• Innovativeness</li> <li>• Attitude toward the brand</li> </ul>
<b>Yim et al. (2017)</b>	The effectiveness of AR in e-commerce compared to traditional e-commerce in influencing consumer evaluations	2 studies conducted among 1059 students	AR has a positive effect on consumer evaluations, but previous media experience may cause the results to vary. Vividness and interactivity have a positive effect on customer evaluations when there is increased immersion, but the immersion in media such as AR is an income of novelty.	<ul style="list-style-type: none"> <li>• Interactivity</li> <li>• Vividness</li> <li>• Immersion</li> <li>• Previous experience</li> <li>• Enjoyment</li> <li>• Media usefulness</li> <li>• Attitude toward medium</li> <li>• Purchase intention</li> </ul>

Table 2: Consumer behavior literature review

Author/Date	Context	Methodology	Conclusions	Variables of focus
<b>Belanche et al. (2017)</b>	The effect high-arousal stimuli have on skippable video ad acceptance. To which level do context congruency and product involvement moderate this effect? Discussion about when is this type of advertising applicable and when not.	3 studies conducted among 366 students	High arousal has a positive effect on skippable video ads acceptance. The positive effect of arousal comes from product involvement and context congruency.	<ul style="list-style-type: none"> <li>• Ad effectiveness</li> <li>• Arousal</li> <li>• Congruency</li> <li>• Product involvement</li> </ul>
<b>Kim et al. (2008)</b>	Exploring customer attitude towards using virtual try-on extension of the e-TAM model. Direct and moderation effect of technology anxiety and innovativeness.	5 focus group interviews Online survey among 491 subjects	Perceived usefulness and perceived entertainment value have a positive effect on attitude toward virtual try-on. The effect of attitude is more substantial with lower technology anxiety and higher innovativeness.	<ul style="list-style-type: none"> <li>• Perceived usefulness</li> <li>• Perceived ease of use</li> <li>• Perceived entertainment value</li> <li>• Attitude</li> <li>• Technology anxiety</li> <li>• Innovativeness</li> <li>• Intended use</li> <li>• Post-use evaluation</li> </ul>
<b>Kim &amp; Niehm (2009)</b>	The effect of different website factors on perceived value, perceived information quality, and loyalty intentions. The correlation between information quality, perceived value, and loyalty intentions.	1 study conducted among 266 students	Interactivity and completeness have a positive effect on perceived information quality. Ease of use has a positive impact on perceived information quality. Perceived information quality has a positive impact on perceived value. Perceived value has a positive effect on loyalty intentions.	<ul style="list-style-type: none"> <li>• Online completeness</li> <li>• Interactivity</li> <li>• Ease of use</li> <li>• Entertainment</li> <li>• Trust</li> <li>• Perceived information quality</li> <li>• Perceived value</li> <li>• Loyalty intentions</li> </ul>
<b>Teixeira et al. (2012)</b>	The effect of the moment-to-moment emotion and attention on the response toward online video advertising.	1 study conducted among 58 students	The emotions of joy and surprise have a positive effect on customer retention of video. The emotions of joy and surprise have a positive effect on attention concentration.	<ul style="list-style-type: none"> <li>• Zapping</li> <li>• Emotion</li> <li>• Attention Dispersion</li> </ul>
<b>Gan &amp; Wang (2017)</b>	Exploring the effect of perceived benefits and risk on purchase intention in social commerce.	1 study conducted among 321 subjects	User satisfaction has a positive impact on purchase intention. Utilitarian value, hedonic value and social value have a positive impact on user satisfaction. Perceived risk negatively affects purchase intention.	<ul style="list-style-type: none"> <li>• Utilitarian value</li> <li>• Hedonic value</li> <li>• Social value</li> <li>• Perceived risk</li> <li>• User satisfaction</li> <li>• Purchase intention</li> </ul>

### 3. Hypothesis development

Processing and implementing information received through augmented reality is faster than when on-screen (Porter & Heppelmann, 2021). Because of this, consumers may perceive that information as of better quality. As AR instructional video will give the customer a chance to feel the product in real-time (Javornik, 2016) compared to traditional instructional video, and therefore process the information faster, the author proposes the following hypothesis:

*H1. The implementation of Augmented reality in the instructional video has a positive effect on perceived information quality.*

As augmented reality is still evolving and is not a mainstream technology (Dacko, 2016), some customers may not feel comfortable using it and the existence of any innovative technology leads to an increase in technology anxiety (Longoni et al., 2022). Such anxiety may cause a customer to give up the product, thus drastically lowering customers' purchase intention. Therefore, the author proposes the following hypothesis:

*H2. The implementation of Augmented reality in the instructional video has a positive effect on technology anxiety.*

Early adopters tend to shop online more frequently and understand technology better (Blut et al., 2020). Understanding technology better leads to less technology anxiety. Additionally, early adopters are primarily well-educated individuals who understand the information given through technology easier (Lam et al. 2014) and could perceive the information given through technology as of better quality. For the purpose of exploring these correlations, the author proposes the following hypotheses:

*H3. The implementation of Augmented reality in the instructional video has a more positive effect on perceived information quality with high rather than low online purchase frequency.*

*H4. The implementation of Augmented reality in the instructional video has a more negative effect on technology anxiety with high rather than low online purchase frequency.*

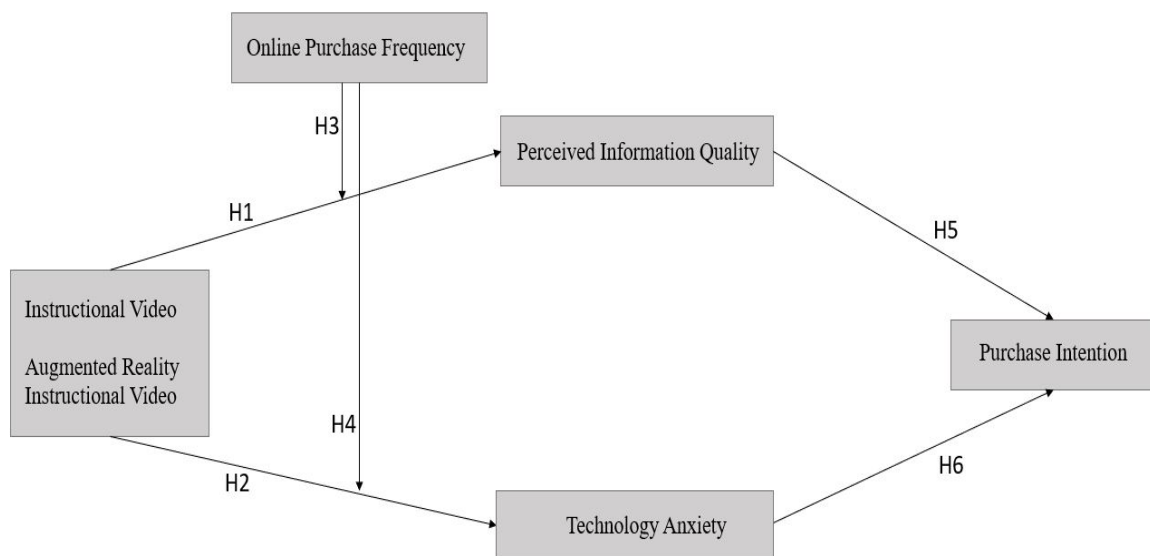
The positive effect of perceived information quality on perceived value, as well as the positive effect of perceived value on purchase intention, is described in the literature review. As information research and information processing are some of the stages consumers go through when buying a product (Engel Kollat Blackwell, 1968), the perceived quality of the information given has an influence on the intention to purchase. To examine the impact of perceived information quality on purchase intention, the author proposes the following hypothesis:

**H5.** *The effect of perceived information quality increases purchase intention.*

Even though customers may find the implemented technology useful for the usage of a certain product, the anxiety they have towards technology usage may cause them to pass up an opportunity to use it (Meuter et al., 2003). This is because consumers change their attitude towards a product if they have anxiety towards the technology connected to the product. Therefore, the author proposes the following hypothesis:

**H6.** *The effect of technology anxiety decreases purchase intention.*

Figure 1: Conceptual map



## **4. Research methodology**

With the attention to test mentioned hypothesis, the author conducted a survey-based experiment to provide needed information. To prove the causal effect between independent and dependent variables, only independent variables must be manipulated, while everything else remains unchanged. For this reason, a survey-based experiment is an adequate method. It has numerous advantages such as ease of data collection, low costs, focus on concrete questions, and the ability to provide concrete answers based on the data collected. Appendix A shows the composition of the surveys and measures.

### **4.1 Experimental design**

For this experiment, the author used two conditions: one showing traditional instructional video and the other one showing instructional video based on augmented reality. As it is crucial for this thesis to test the outcome of these two conditions, the author chose a between-subject design and tested every subject only once. For such experiment, the author assigned the subjects to a condition randomly – 50 subjects per condition. In the end, the sample unit consisted of 111 subjects. With the attention to having a more representative sample, the target population varied in terms of age, gender, and location.

### **4.2 Conditions**

Throughout the experiment, the author manipulated two conditions: the control condition, which included a link to a traditional instructional video on YouTube, and the treatment condition, which included a QR code to an instructional video based on augmented reality. Prior to starting the research, the author filmed an instructional video and uploaded it to a YouTube channel for easier access. Additionally, the author found a 3-D version of the vacuum on grabcad.com and re-designed it to make sure that it resembles the vacuum in the online video as much as possible. Appendix B shows the original version of the 3-D vacuum cleaner. Afterward, the author learned about Jig Space software and how to use it. This software is used for building 3-D presentations and converting them into augmented reality using an iPad. The technical capabilities of this software ensured that the presentation was realistic and easy to understand. Following this,

the author made a presentation on Jig Space software with the same content as the online video and transferred it into augmented reality.

### **4.3 Procedure**

For the first condition, the author collected data online. Firstly, the survey shows a brief introduction with information regarding the study and the author. On the next page of the survey, subjects saw a link that led to the traditional version of the instructional video on YouTube showing the vacuum and instructions on how to change the filter on it. After watching the video, subjects filled up a questionnaire about the video and their purchase intent of the product.

The author collected the data from the second condition in person, as it was more efficient to show the AR instructional video on one device, therefore being sure that everyone questioned had the same experience. In the beginning, every subject saw the same introduction as in the first condition to get additional information about the study and the author. Afterward, subjects saw the augmented reality instructional video showing the instructions on how to change a filter on a vacuum cleaner. Lastly, the subjects answered the same questions as the control group with questions about the augmented reality video and the purchase intent.

### **4.4. Pretest**

Prior to conducting the survey, the author has done a pretest in order to acknowledge how subjects perceived the survey in the context of clarity and content to make sure the collected data will be of good quality. Four people participated in the pretest, two in each condition. After doing the surveys, the subjects concluded that most of the questions were understandable, direct, and on point. The author reworded the questions measuring risk aversion before the surveys went public, as the subjects found them confusing.



## 4.5. Measures

**Purchase intention** Purchase intention is the tendency to buy a product in a certain situation. To measure this variable, the author followed the measuring of Fuchs et al. (2010). Subjects answered the following question: "How likely is it that you would buy this product?" The question was evaluated on a seven-point Likert scale, ranging from 1 (Extremely unlikely) to 7 (Extremely likely).

**Technology anxiety** to measure technology anxiety, the author shortened and followed the scale of Meuter et al. (2003). The author used only questions with the highest values. To measure this variable, subjects evaluated the following sentences: "After seeing the (AR-based) online video, I have difficulty understanding internet-related matters." "When given an opportunity to use (AR-based) online videos, I fear I might make a mistake" "Online video (AR) terminology is confusing me." The sentences were evaluated on a seven-point Likert scale, ranging from 1 (Strongly disagree) to 7 (Strongly agree).

**Perceived Information quality** has four dimensions: completeness, accuracy, format, and currency of information (Wixom and Todd 2005). To measure the perceived information quality, the author implemented the measuring of Setia et al. (2013). As there are four dimensions, a separate sentence measures every dimension. The subjects evaluated the following sentences: "The (AR-based) instructional video provides all the information needed to change a filter on a vacuum," "The information provided by (AR-based) instructional video is accurate," "The provided information is clearly presented," and "The information provided by (AR-based) instructional video is up to date." The sentences were evaluated on a seven-point Likert scale, ranging from 1 (Strongly disagree) to 7 (Strongly agree).

**Online purchase frequency** for the purpose of this research, the author chose to measure a period of six months to avoid memory bias and factor out any answers that relate to the distant memory. To measure purchase frequency, the author followed the updated measuring of Le Boutillier et al. (1994). For measuring the number of online purchases, subjects answered the following question: "Approximately how many times have you shopped online in the past 6 months?" The question is evaluated on a 7-point Likert scale, ranging from 1 (Very infrequently) to 7 (Very frequently).

#### 4.6. Control variables

**Demographics** The author used questions about age, gender, country of residence, level of education, and employment status to measure demographical factors that may influence the subject's answers.

**Task difficulty** Since the author conducted the two surveys in diverse ways, one in person and one online, the subjects may have perceived the tasks differently. To measure any difference in task difficulty subjects might have experienced based on the environment of the survey, the author measured task difficulty. To measure the difficulty of the task, the author followed and updated the measuring of Lewis, J. R. (1995). The subjects evaluated the following sentences: "I am satisfied with the ease of completing the survey" and "I am satisfied with the amount of time it took to complete the survey" The sentences were evaluated on a seven-point Likert scale with a range from 1 (Strongly disagree) to 7 (Strongly agree).

**Preference expression** to make sure that the survey enables the subject to express hers or his preference without any trouble, the author measured preference expression. To measure the preference expression, the author followed the measuring of Ding et al. (2011). The subjects rated the following sentences: "This survey enables me to accurately express my preference" and "I have enjoyed taking this survey" The sentences were evaluated on a seven-point Likert scale with a range from 1 (Strongly disagree) to 7 (Strongly agree).

**Risk aversion** to measure risk aversion, the author updated and followed the measuring of Ganesh et al. (2000). Subjects evaluated the following sentences: "When buying a product, I would rather be safe than sorry," "I want to be sure before I purchase anything" "I avoid unfamiliar products" "I like to take chances with unfamiliar products." The sentences were evaluated on a seven-point Likert scale, ranging from 1 (Strongly disagree) to 7 (Strongly agree).

## 5. Empirical analysis

### 5.1. Descriptive statistics

For the first condition, the author distributed the survey via link. 66 respondents filled out the survey, and all the surveys were filled out completely, so there was no need to exclude anyone. The age of respondents ranges from 19 to 39, and 59.1% of the sample is female while 40.9% is male. The majority of the sample had obtained a bachelor's diploma, while 30.3% had finished their master's studies. When it comes to employment status, the majority are students, while a small fraction is employed and unemployed. The majority of the sample is from the Netherlands, while the second largest group is Serbia (31.8%).

For the second condition, 55 volunteer respondents filled out the survey after a presentation of the AR instructional video. The age of respondents ranges from 18 to 61, and 69.6% of the sample is female while 30.4% is male. The majority of the sample had obtained a bachelor's diploma, while 28.6% had finished their master's studies. When it comes to employment status, the majority are students while a smaller fraction is employed. The majority of the sample lives in the Netherlands, and the second largest group lives in Serbia (37.5%). Additional information about the values of control variables is shown in table 3.

*Table 3: Descriptive statistics*

<b>Variable</b>	<b>Condition: AR Most frequent value (Percentage)</b>	<b>Condition: Video Most frequent value (Percentage)</b>
<b>Age</b>	25 (17.9%)	25(25.8%)
<b>Gender</b>	Female (69.6%)	Female (59.1%)
<b>Country</b>	Netherlands (57.1%)	Netherlands (42.4%)
<b>Education</b>	Bachelor's degree (48.2%)	Bachelor's degree (54.5%)
<b>Employment status</b>	Student (60.7%)	Student (63.6%)

### 5.3. Reliability analysis

To check the internal consistency and reliability of the questionnaire, the author measured Cronbach's alpha for all scale questions, such as perceived information quality, technology anxiety, risk aversion, and task difficulty. The factor loadings of the variables should be over 0.50 to prove that the values are internally consistent (Van Esch et al., 2019). The scale showed Cronbach's alpha of 0.790 for 4 questions about perceived information quality, showing that the answers are consistent. For 4 questions about technology anxiety, the scale showed Cronbach's alpha of 0.831, showing that there is consistency between the answers. Cronbach's alpha of risk aversion, which also contained four questions with one reversed question, is 0.645, indicating that the answers are also consistent. Lastly, there are two questions about task difficulty, and the scale showed Cronbach's alpha of 0.770, presenting a consistency between the answers.

*Table 4: Reliability analysis*

<b>Variable</b>	<b>Cronbach's alpha</b>
<b>Perceived information quality</b>	0.790
<b>Technology anxiety</b>	0.831
<b>Risk aversion</b>	0.645
<b>Task difficulty</b>	0.770

## 5.4. Variables specification

The table underneath gives a description of all the variables and their coding in regression models.

*Table 5: Variables overview*

<b>Variable name</b>	<b>Description</b>
<b>Traditional instructional video vs. augmented reality instructional video (Video/AR)</b>	0 if the respondent has seen the traditional video, 1 if the respondent has seen the augmented reality video
<b>Perceived information Quality (PercievedInfoQuality)</b>	Likert scale: 1- strongly agree to 7 -strongly disagree Coded into one variable based on the mean
<b>Technology Anxiety (TechAnxiety)</b>	Likert scale: 1- strongly agree to 7 -strongly disagree Coded into one variable based on the mean
<b>Online purchase frequency</b>	Likert scale: 1- very infrequently to 7 -very frequently
<b>Risk aversion</b>	Likert scale: 1- strongly agree to 7 -strongly disagree Coded into one variable based on the mean
<b>Purchase Intention (PurchaseIntent)</b>	Likert scale: 1- very unlikely to 7 -very likely
<b>Age</b>	Continuous variable
<b>Gender</b>	0 if the respondent is male, 1 if the respondent is female
<b>Education</b>	Re-coded into 3 dummy variables: High School Bachelor's and Master's
<b>Employment status</b>	Re-coded into 3 dummy variables: Employed, Unemployed, and Student
<b>Country of residence (Country)</b>	Re-coded into one dummy variable: 1 if the country is Netherlands 0 for any other country
<b>Task difficulty</b>	Likert scale: 1- strongly agree to 7 -strongly disagree Coded into one variable based on the mean

## 5.5. Model specification

To examine the collected data and test the proposed hypotheses, the author used multiple linear regression, as it clearly shows the value of every variable by itself. The author developed a model for every hypothesis proposed in the hypothesis development chapter.

### **Model 1: The mediation effect of perceived information quality on purchase intention and implementation of augmented reality instructional video.**

$$Y(\text{Purchase intent}) = b_0 + b_1 \text{Video/AR} + b_2 \text{Perceived Info Quality} + b_3 \text{Age} + b_4 \text{Country} + b_5 \text{High School} + b_6 \text{Bachelor} + b_7 \text{Masters} + b_8 \text{Employed} + b_9 \text{Unemployed} + b_{10} \text{Student} + e$$

### **Model 2: The mediation effect of technology anxiety on purchase intention and implementation of augmented reality instructional video**

$$Y(\text{Purchase intent}) = b_0 + b_1 \text{Video/AR} + b_2 \text{Tech Anxiety} + b_3 \text{Age} + b_4 \text{Country} + b_5 \text{High School} + b_6 \text{Bachelor} + b_7 \text{Masters} + b_8 \text{Employed} + b_9 \text{Unemployed} + b_{10} \text{Student} + e$$

### **Model 3: The effect of interaction between Augmented reality instructional video and purchase frequency on perceived information quality**

$$Y(\text{Perceived information quality}) = b_0 + b_1 \text{Video/AR} + b_2 \text{Age} + b_3 \text{Country} + b_4 \text{High School} + b_5 \text{Bachelor} + b_6 \text{Masters} + b_7 \text{Employed} + b_8 \text{Unemployed} + b_9 \text{Student} + b_{10} \text{Purchase Frequency} + b_{11} \text{Video/AR} \times \text{Purchase Frequency} + e$$

### **Model 4: The effect of interaction between Augmented reality instructional video and purchase frequency on technology anxiety**

$$Y(\text{Tech Anxiety}) = b_0 + b_1 \text{Video/AR} + b_2 \text{Age} + b_3 \text{Country} + b_4 \text{High School} + b_5 \text{Bachelor} + b_6 \text{Masters} + b_7 \text{Employed} + b_8 \text{Unemployed} + b_9 \text{Student} + b_{10} \text{Purchase Frequency} + b_{11} \text{Video/AR} \times \text{Purchase Frequency} + e$$

**Model 5: The effect of perceived information quality and technology anxiety on purchase intention**

$$Y(\text{Purchaseintention})=b_0+b_1\text{PerceivedInfoQuality}+b_2\text{TechAnxiety}+b_3\text{Age}+b_4\text{Country}+b_5\text{High School}+b_6\text{Bachelor}+b_7\text{Masters}+b_8\text{Employed}+b_9\text{Unemployed}+b_{10}\text{Student} + e$$

**6. Results**

After specifying all the models, the author tested every model using SPSS. First, the author tested all the models in full, with all of the variables. Afterward, the author tested every model without demographic variables, and task difficulty and preference expression were added to test if the survey itself had any impact on the output. The version of the model without demographics and with task difficulty and preference expression is marked with "a" in further discussion. As the sample is small, the author chose the confidence level of 90% ( $\alpha=0.10$ ). The following table shows a summary of ANOVA results for all regression models.

*Table 6: Summary of ANOVA results*

	<b>Model 1</b>	<b>Model 1a</b>	<b>Model 2</b>	<b>Model 2a</b>	<b>Model 3</b>	<b>Model 3a</b>	<b>Model 4</b>	<b>Model 4a</b>	<b>Model 5</b>	<b>Model 5a</b>
<b>Sum of squares</b>	3.912	12.609	15.158	15.925	4.233	15.322	17.359	18.612	61,733	70.100
<b>DF</b>	10	3	10	3	12	5	12	5	11	4
<b>Mean square</b>	0.391	4.203	1.516	5.308	0.353	3.064	1.447	3.722	5.612	17.525
<b>F</b>	0.460	5.791	0.935	3.497	0.409	4.286	0.887	2.447	2.122	7.255
<b>Sig.</b>	0.912	<0.001	0.504	0.018	0.957	0.001	0.562	0.038	0.024	<0.001
<b>R</b>	0.200	0.358	0.279	0.286	0.208	0.395	0.298	0.309	0.418	0.446
<b>R<sup>2</sup></b>	0.040	0.128	0.078	0.082	0.043	0.156	0.089	0.095	0.175	0.199
<b>Adj. R<sup>2</sup></b>	-0.047	0.106	-0.005	0.058	-0.062	0.120	-0.011	0.056	0.093	0.171

## 6.1. Hypothesis 1

Hypothesis 1 indicates that augmented reality instructional video has a positive effect on perceived information quality. To evaluate this hypothesis, the author used model 1. The results of model 1 show a p-value of 0.912 (Table 6), indicating that the results are insignificant. Before rejecting the hypothesis, the author ran another test without the demographic variables, but included task difficulty and preference expression. Even though the results of the new model have a p-value of  $<0.001$ , augmented reality does not have a significant effect on perceived information quality as its p-value is 0.631 (Table 7). In conclusion, there is no support for hypothesis 1.

*Table 7: Model 1a Coefficients*

<b>Variable name</b>	<b>B</b>	<b>Std.Error</b>	<b>Standardized coefficients Beta</b>	<b>t</b>	<b>Sig</b>
<b>Video/AR</b>	-0.079	0.163	-0.044	-0.428	0.631
<b>Task Difficulty</b>	0.172	0.089	0.193	1.924	0.057
<b>Preference expression</b>	0.180	0.079	0.233	2.288	0.024

*Dependent variable: Perceived Information Quality*

## 6.2. Hypothesis 2

Hypothesis 2 indicates that augmented reality instructional video has a positive effect on technology anxiety. To evaluate this hypothesis, the author used model 2. The results of model 2 showed a p-value of 0.504 (Table 6), indicating that the results are insignificant. Before rejecting the hypothesis, the author ran another test without the demographic variables, but added task difficulty and preference expression. The results of this new model are significant only when task difficulty is used alone with augmented reality. In this case, the p-value is 0.18, and the R-value of this model is 0.286, showing that the independent variable explains 29% of the data of the dependent variable. When using this model, both augmented reality and task difficulty have a significant effect on technology anxiety (Table 8). Augmented reality has a positive B value of 0.409, showing that when augmented reality goes up by one unit, tech anxiety goes up by 0.409. As a result, we can



conclude that augmented reality has a positive impact on technology anxiety, and there is support for hypothesis 2, but only when task difficulty is also taken into account.

*Table 8: Model 2a Coefficients*

Variable name	B	Std.Error	Standardized coefficients Beta	t	Sig
Video/AR	0.409	0.235	0.161	1.730	0.086
Task Difficulty	-0.369	0.129	-0.294	-2.860	0.005
Preference Expression	0.159	0.114	0.146	1.392	0.167

*Dependent variable: Technology Anxiety*

### 6.3. Hypothesis 3

Hypothesis 3 states that online purchase frequency strengthens the effect augmented reality instructional video has on perceived information quality. To evaluate this hypothesis, the author used model 3. The results of the regression show a p-value of 0.957, which indicates that the results are insignificant (Table 6). However, before rejecting the hypothesis, the author ran another regression model without demographic variables and added task difficulty and preference expression. Now the results have changed completely and are significant, with a p-value of 0.001. The R-value of this model is 0.395, showing that the independent variable explains 39.5% of the data of the dependent variable. Now all of the independent variables have a significant effect on perceived information quality (Table 9). Both augmented reality and purchase frequency have a negative B value, showing that there is a negative relationship between these variables and perceived information quality. What is interesting is that the product of augmented reality and purchase intention has a positive impact on perceived information quality with a B value of 0.161, showing that if the product of these variables goes up by 1 unit, perceived information quality goes up by 0.161. Additionally, task difficulty and preference expression both have a positive impact on perceived information quality (Table 9). The effect of online purchase frequency on the relationship between augmented reality instructional video and perceived information quality is therefore significant, and there is support for hypothesis 3, only when task difficulty and preference expression are taken into account and demographic variables are expelled.

Table 9: Model 3a Coefficients

Variable name	B	Std.Error	Standardized coefficients Beta	t	Sig
Video/AR	-0.857	0.473	-0.476	-1.810	0.073
Purchase Frequency	-0.118	0.064	-0.223	-1.832	0.069
PurchaseFrequenc yXVideo/AR	0.161	0.093	0.477	1.743	0.084
Preference Expressing	0.200	0.080	0.259	2.514	0.013
Task Difficulty	0.201	0.090	0.225	2.234	0.027

Dependent variable: Perceived Information Quality

#### 6.4. Hypothesis 4

Hypothesis 4 states that online purchase frequency strengthens the effect augmented reality instructional video has on technology anxiety. To evaluate this hypothesis, the author used model 4. The results show a p-value of 0.562, which indicates that the results are insignificant (Table 6). Before rejecting the hypothesis, the author ran a regression model without demographic variables and added task difficulty and preference expression. Now the results are completely different and significant with a p-value of 0.038. This model has an R-value of 0.309, showing that the independent variable explains 31% of the data of the dependent variable (Table 6). Even though the model is significant, none of the variables have a significant effect on technology anxiety, except for task difficulty (Table 10). However, this is not sufficient when it comes to evaluating hypothesis 4. The effect of online purchase frequency on the relationship between augmented reality instructional video and technology anxiety is not considered significant. Therefore, there is no support for hypothesis 4.

Table 10: Model 4a Coefficients

Variable name	B	Std.Error	Standardized coefficients Beta	t	Sig
Video/AR	0.710	0.691	0.280	1.028	0.306
Purchase Frequency	-0.054	0.094	-0.072	-0.573	0.568
PurchaseFrequencyXVideo/AR	-0.064	0.135	-0.134	-0.472	0.638
Preference Expressing	0.181	0.116	0.167	1.563	0.121
Task Difficulty	-0.368	0.131	-0.293	-2.811	0.006

Dependent variable: Technology Anxiety

### 6.5. Hypotheses 5 and 6

Hypothesis 5 indicates that perceived information quality has a positive effect on purchase intention and hypothesis 6 states that technology anxiety has a positive effect on purchase intention. To evaluate these hypotheses, the author used model 5. The analysis results show a p-value of  $<0.024$ , showing that the results are significant (Table 6). Additionally, the R-value of this model is 0.418, showing that the independent variable explains 42% of the data of the dependent variable. Linear regression has shown that perceived information quality has a significant impact on purchase intention (p-value= $<0.001$ ), showing that if information quality goes up by 1 unit, purchase intention will go down by -0.664 units (Table 11). To see if the results change and give a positive output when task difficulty and preference expression are included in the model, the author added them and excluded demographic variables. The results of the new model show a p-value of  $<0.001$ , but perceived information quality still has a negative effect on purchase intention (Table 12). In conclusion, the effect of perceived information quality on purchase intention is significant, but there is no support for hypothesis 5 as perceived information quality decreases purchase intention.

When it comes to hypothesis 6, model 5 shows that technology anxiety does not have a significant impact on purchase intention. As in the previous cases, the author ran another

regression analysis with task difficulty and preference expression in the model and without demographic variables to see if the results change and give a positive output. The results of the new model resulted in a p-value of 0.001, and the R-value of this model is 0.446, showing that the independent variable explains 46% of the data of the dependent variable. However, technology anxiety still did not have a significant impact on purchase intention (Table 11). Even though the results of the whole regression are significant, technology anxiety does not have a significant effect on purchase intention. Therefore, there is no support for hypothesis 6.

*Table 11: Model 5 Coefficients*

<b>Variable name</b>	<b>B</b>	<b>Std.Error</b>	<b>Standardized coefficients Beta</b>	<b>t</b>	<b>Sig</b>
<b>Perceived Information Quality</b>	-0.664	0.1174	-0.350	-3.820	<0.001
<b>Technology Anxiety</b>	-0.170	0.126	-0.126	-1.351	0.180
<b>Age</b>	-0.029	0.024	-0.133	-1.228	0.222
<b>Gender</b>	0.583	0.316	0.165	1.848	0.067
<b>Country</b>	-0.058	0.341	-0.017	-0.170	0.865
<b>High School</b>	-0.187	1.277	-0.041	-0.146	0.884
<b>Bachelor's</b>	-0.943	1.221	-0.227	-0.773	0.441
<b>Master's</b>	-0.839	1.218	-0.225	-0.689	0.493
<b>Employed</b>	-0.306	1.207	-0.084	-0.253	0.801
<b>Unemployed</b>	0.148	1.451	0.015	0.102	0.919
<b>Student</b>	-0.458	1.184	-0.131	-0.387	0.700

*Dependent variable: Purchase intention*

Table 12: Model 5a Coefficients

Variable name	B	Std.Error	Standardized coefficients Beta	t	Sig
Perceived Information Quality	-0.380	0.175	-0.201	-2.177	0.031
Technology Anxiety	-0.129	0.119	-0.096	-1.085	0.280
Preference Expressing	-0.494	0.147	-0.337	-3.365	0.01
Task Difficulty	0.000	0.167	0.000	-0.002	0.998

Dependent variable: Purchase intention

## 6.6. Additional results

### 6.6.1. The effect of Augmented reality on purchase intention

To see if augmented reality itself has any significant impact on purchase intention, the author ran another regression analysis with purchase intention as a dependent variable and augmented reality and demographic variables as independent. This model is significant, with a p-value of 0.001 and R<sup>2</sup> value of 0.472 (Table 13). Linear regression with all control variables shows that augmented reality has a significant and positive impact on purchase intention, with a p-value of 0.001 and B coefficient of -1.458, meaning that when augmented reality exists, purchase intention goes down by 1.458 (Table 14).

Table 13: Effect of Augmented reality on Purchase intention – ANOVA results

	Sum of squares	DF	Mean Square	F	Sig.	R	R <sup>2</sup>	Adj.R <sup>2</sup>
Effect of AR on Purchase intention	78.475	10	7.848	3.176	0.001	0.472	0.222	0.152

Table 14: Effect of Augmented reality on Purchase intention- coefficients

Variable Name	B	Std.Error	Standardized coefficients Beta	t	Sig.
<b>Video/AR</b>	-1.458	0.307	-0.427	-4.743	0.001
<b>Age</b>	-0.007	0.023	-0.031	-0.292	0.771
<b>Gender</b>	0.311	0.306	0.088	1.015	0.312
<b>Country</b>	-0.506	0.339	-0.149	-1.493	0.138
<b>High School</b>	0.093	1.235	0.021	0.076	0.940
<b>Bachelor's</b>	-0.732	1.177	-0.215	-0.622	0.535
<b>Master's</b>	-0.607	1.176	-0.163	-0.516	0.607
<b>Employed</b>	0.336	1.172	0.101	0.312	0.755
<b>Unemployed</b>	0.684	1.399	0.072	0.489	0.626
<b>Student</b>	0.102	1.143	0.029	0.089	0.929

*Dependent variable: Purchase intention*

As most of the results change when the effect of task difficulty and preference expression are taken into account, the author ran an additional two analyses to evaluate how the existence of augmented reality impacts these variables.

Table 15: Effect of Augmented reality on Preference expression and Task Difficulty – ANOVA results

	Sum of squares	DF	Mean Square	F	Sig.	R	R <sup>2</sup>	Adj.R <sup>2</sup>
<b>Effect of AR on Task Difficulty</b>	23,258	10	2.326	2.567	0.008	0.334	0.188	0.115
<b>Effect of AR on Preference Expression</b>	46.745	10	4.675	4.408	0.001	0.533	0.284	0.220

### 6.6.2. The effect of Augmented reality on task difficulty

The first analysis shows significant results, as the p-value is 0.008 (table 15). Additionally, the R-value of this model is 0.334, showing that the independent variable explains 33% of the data of the dependent variable. Linear regression with all control variables shows that augmented reality has a significant and positive impact on task difficulty, with a p-value of 0.049 and B coefficient of 0.371, meaning that when augmented reality exists, task difficulty goes up by 0.371 (Table 16).

Table 16: Effect of AR on Task Difficulty - coefficients

Variable Name	B	Std.Error	Standardized coefficients Beta	t	Sig.
<b>Video/AR</b>	0.371	0.186	0.183	1.992	0.049
<b>Age</b>	0.020	0.014	0.155	1.425	0.157
<b>Gender</b>	-0.194	0.185	-0.092	-1.046	0.298
<b>Country</b>	-0.117	0.205	-0.058	-0.571	0.569
<b>High School</b>	0.085	0.748	0.032	0.113	0.910
<b>Bachelor's</b>	0.047	0.713	0.023	0.065	0.948
<b>Master's</b>	0.107	0.712	0.049	0.151	0.881
<b>Employed</b>	-0.672	0.710	-0.313	-0.947	0.346
<b>Unemployed</b>	-2.541	0.847	-0.449	-2.999	0.003
<b>Student</b>	-0.628	0.692	-0.302	-0.907	0.366

Dependent variable: Task Difficulty

### 6.6.3. The effect of augmented reality on preference expression

The second analysis also shows significant results, as the p-value is 0.001 (table 15). The independent variable explains 53% of the data of the dependent variable (R=0.533). Linear regression with all control variables shows that augmented reality has a significant and positive impact on preference expression, with a p-value of 0.002 and B coefficient of 0.638, meaning that when augmented reality exists, preference expression goes up by 0.638 (Table 17). Another interesting fact about this analysis is that age also has a significant effect on preference expression, with a B coefficient of 0.026, which means that when age goes up by one unit, task difficulty goes up by 0.026.

Table 17: Effect of AR on Preference Expression- coefficients

Variable name	B	St. Error	Standardized coefficients Beta	t	Sig.
<b>Video/AR</b>	0.638	0.201	0.274	- 3.170	0.002
<b>Age</b>	0.026	0.015	0.176	1.721	0.088
<b>Gender</b>	0.313	0.201	0.130	1.563	0.121
<b>Country</b>	0.186	0.222	0.080	0.836	0.405
<b>High School</b>	- 0.730	0.809	-0.237	- 0.902	0.369
<b>Bachelor's</b>	- 0.909	0.771	-0.391	- 1.179	0.241
<b>Master's</b>	- 0.908	0.770	-0.357	- 1.179	0.241
<b>Employed</b>	- 0.767	0.768	-0.310	- 1.000	0.320
<b>Unemployed</b>	- 3.231	0.917	-0.496	- 3.525	<0.001
<b>Student</b>	- 0.833	0.749	-0.348	- 1.112	0.268

Dependent variable: Preference expression

### Hypothesis 3: spotlight analysis

The results of model 3a show that the interaction effect of online purchase frequency and augmented reality on perceived information quality is positive and significant. However, these results are estimated on online purchase frequency being equal to zero. To see if the effect of augmented reality is still positive and significant when online purchase frequency is at some other level, the author did a Spotlight analysis. As online purchase frequency is measured on a 7-point scale, the author chose three values for Spotlight analysis: 1-when online shopping is very infrequent, 4- when online shopping is done on occasion, and 7- when online shopping is done very frequently. The new results show augmented reality is the only variable that changes. For that reason, table 18 depicts only the values of augmented reality in the results of these regression analyses.



Table 18: Spotlight analysis – Augmented reality coefficients

Variable name	B	Std.Error	Standardized coefficients Beta	t	Sig
Video/AR when online purchase frequency -1	-0.695	0.388	-0.386	-1.793	0.076
Video/AR when online purchase frequency -4	-0.212	0.179	-0.117	-1.185	0.239
Video/AR when online purchase frequency -7	0.272	0.260	0.151	1.048	0.297

Dependent variable: Perceived Information Quality

When it comes to these three meaningful values, augmented reality is only significant when online purchase frequency is centered at 1. When online purchase frequency is centered at 1, augmented reality has a p-value of 0.076 and a B coefficient of -0.695 (Table 18), which means that augmented reality has a negative effect on perceived information quality.

## 7. Conclusion

### 7.1. General Discussion

The findings of this research indicate that augmented reality does not have a significant impact on perceived information quality and technology anxiety by itself, as both significance values are above the alpha of 0.10. When task difficulty alone is included in the model, the effect of augmented reality on technology anxiety becomes significant, and the existence of augmented reality does lead to a rise in technology anxiety.

Secondly, this study found that the interaction between augmented reality and purchase frequency positively affects perceived information quality. These results show that people who shop more online see the information received through augmented reality as of better quality. This is especially interesting if we take into account that both augmented reality and purchase frequency alone did not have a positive effect on perceived information quality. What is more, perceived information quality has an impact on purchase intention, but a negative one, which may lead to a conclusion that people who know more about a product do not want to buy it, as it is too familiar to them.

Additionally, when analyzed together with demographic variables, augmented reality has an impact on purchase intention, but the impact is negative with a beta coefficient of -1.458. The results are completely different from the initial thinking but may be caused by some different interactions that were not analyzed in this paper.

Furthermore, none of the models show that technology anxiety had any significant impact on purchase intention. The models that included technology anxiety did not change the significance of this variable even with task difficulty and preference expression, which is different from all the other models.

What is interesting is that task difficulty and preference expression made a lot of difference when it comes to results. Additionally, augmented reality has a positive impact on both task difficulty and preference expression, showing that the task was more difficult for the subjects when they had to watch an instructional video in augmented reality first, but also that they felt it was easier to express their preference after watching an augmented reality instructional video. These findings represent two different effects augmented reality can have: the positive effect, as augmented reality raises preference expression, and the negative effect in which augmented reality makes a task more difficult.

## **7.2. Academic Implications**

The findings of this study contribute to the existing academic research in several ways.

First, this research broadened the existing literature on augmented reality by examining a new way to use augmented reality in marketing which is instructional video based on augmented reality. The findings of this study show the effect augmented reality has when showing information to customers and how do they perceive this information. Moreover, this study gives insights into how online purchase frequency changes the effect of augmented reality on perceived information quality. The findings of this study indicate that the interaction of augmented reality instructional videos and online purchase frequency causes subjects to perceive the information as of better quality.

Additionally, the findings of this study shed light on the importance of the methods that researchers use when conducting research. The results show that it is important how research is conducted when it comes to augmented reality, as the significance of the output of this study changed when we included task difficulty and preference expression. Both of

these variables are connected to the survey itself, showing the importance of having a survey that is easily done and gives the opportunity to the subject to express their opinion.

### **7.3. Managerial implications**

The findings of this research could help managers in several ways.

Firstly, the outcome of this research indicates that perceived information quality has a negative effect on purchase intention, which leads to a conclusion that telling too much about a product may backfire, and people will not feel the need to buy it if they know everything about it. Additionally, this research has found that augmented reality has a negative effect on purchase intention as well. Therefore, managers need to choose the right product when they decide on using augmented reality instructional video for communication.

Secondly, the findings of this study show that the interaction between online purchase frequency and augmented reality has a positive effect on perceived information quality. This could lead to a conclusion that customers who shop more online will perceive information given through augmented reality as of better quality. Thus, it is important for managers to target the customers who shop more online with augmented reality instructional videos when they need to present new information.

What is more, this research shows that implementation of augmented reality results in higher task difficulty and higher perceived information quality. These findings implicate that using augmented reality may cause customers to feel that a task is more difficult, which may lead to lower purchase intention. On the other hand, augmented reality may help customers express their preferences better. Consequently, managers should focus on making the augmented reality tasks easier and use them when they are conducting market research. Additionally, managers should focus on using augmented reality in cases when they feel that customers can express their preferences better.

### **7.4. Limitations and future research directions**

Some of the limitations of this study are caused by the sample. First, the sample for this study is small, and the results may differ when there is a larger sample. In relation to this, any future research should have a sample with at least a double number of respondents to

see if the results change. Moreover, the sample consists of mostly students under the age of 30 who are generally using technology more and are the main age group when it comes to early adopters, which could mean that their technology anxiety is lower when it comes to augmented reality.

Additionally, the subjects in survey two saw augmented reality instructional videos only on an iPad screen, and they may feel different about the technology itself if the results were shown using a different device. Therefore, future studies on this topic should examine augmented reality instructional videos in a different media setting, for example, by using augmented reality glasses. Furthermore, the author used a vacuum cleaner to demonstrate augmented reality, and the results may be different if the product was more complex and more unfamiliar to the subjects.

Despite these limitations, this study provides novel insights into the way augmented reality can be used to communicate with consumers and the effect this way of communication has on consumer behavior.

Appendix A:

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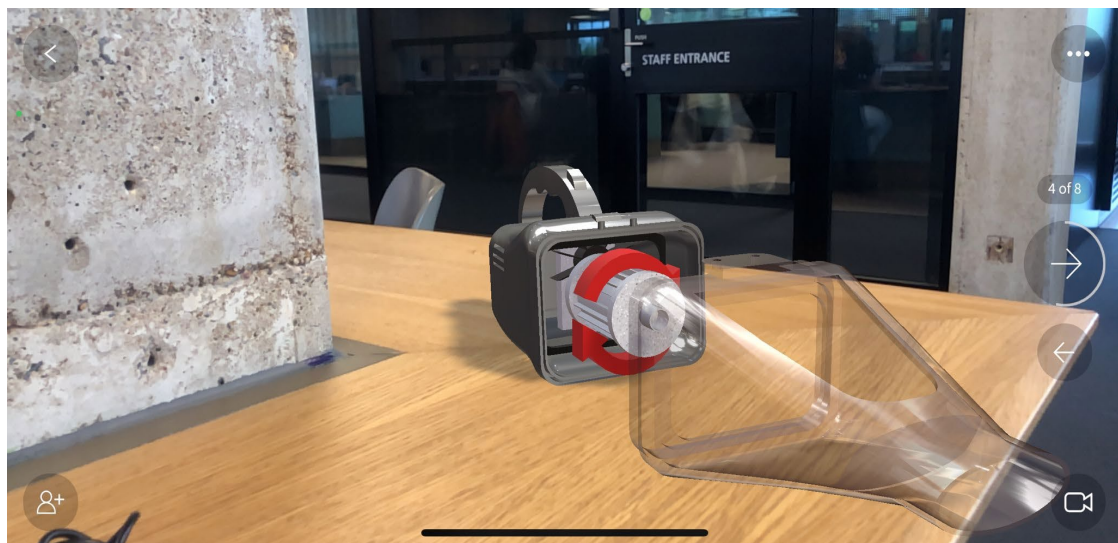
Stimuli

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Study 1: Review of the instructional video



Study 2: Review of AR instructional video



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Measurements

Perceived Information quality Setia et al (2013) *Please evaluate the following statement: 1 – Strongly disagree 7-Strongly agree*

- a) The (AR-based) instructional video provides all the information needed to change a filter on a vacuum.
- b) The information provided by (AR-based) instructional video is accurate.
- c) The provided information is clearly presented.
- d) The information provided by (AR-based) instructional video is up to date.

1- Strongly disagree

4- Neutral

7- Strongly agree

---

- 
- |                          |                       |
|--------------------------|-----------------------|
| 2- Disagree              | 5- More or less agree |
| 3- More or less disagree | 6- Agree              |
- 

**Technology anxiety Meuter et al (2003) Please evaluate the following statements: 1 – Strongly disagree 7-Strongly agree**

---

- a) After seeing the online video, I have difficulty understanding internet related matters.
- b) When given an opportunity to use online videos, I fear I might make a mistake.
- c) Online video (AR) terminology is confusing me.
- d) I have avoided (AR) online videos because they are unfamiliar to me.

- |                          |                       |                   |
|--------------------------|-----------------------|-------------------|
| 1- Strongly disagree     | 4- Neutral            | 7- Strongly agree |
| 2- Disagree              | 5- More or less agree |                   |
| 3- More or less disagree | 6- Agree              |                   |
- 

**Online purchase frequency Le Boutillier et al (1994): Please answer the following question: 1 –Very infrequently 7- Very frequently**

---

Approximately, how often have you shopped online in the past 6 months?

- |                      |                |                    |
|----------------------|----------------|--------------------|
| 1- Very infrequently | 4- On occasion | 7- Very frequently |
| 2- Infrequently      | 5- Sometimes   |                    |
| 3- Rarely            | 6- Frequently  |                    |
- 

**Risk aversion Ganesh et al (2000) Please evaluate the following statements: 1 – Strongly disagree 7-Strongly agree**

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- a) When shopping online, I would rather be safe than sorry.
- b) I want to be sure before I purchase anything.
- c) I avoid unfamiliar products.
- d) I like to take chances with unfamiliar products.

- |                          |                       |                   |
|--------------------------|-----------------------|-------------------|
| 1- Strongly disagree     | 4- Neutral            | 7- Strongly agree |
| 2- Disagree              | 5- More or less agree |                   |
| 3- More or less disagree | 6- Agree              |                   |
- 

**Purchase intention Fuchs et al (2010) Please answer the following question:1 - Extremely unlikely 7-Extremely likely**

---

How likely is it that you would buy this vacuum?

- |                       |                    |                     |
|-----------------------|--------------------|---------------------|
| 1- Extremely unlikely | 4- Neutral         | 7- Extremely likely |
| 2- Unlikely           | 5- Slightly likely |                     |
| 3- Slightly unlikely  | 6- Likely          |                     |
- 

**Control variables**

---

**Age** - Please indicate your age: \_\_\_\_\_

**Gender** - Please indicate your gender:

- 0- Female
  - 1- Male
-

---

**Level of education** - What is the highest level of obtained education:

- 1- High school degree      3- Master's degree  
2- Bachelor's degree      4- Doctorate

**Employment status** - What is employment status?

- 1- Employed                      3- Student                      5- Other  
2- Unemployed                4- Retired

**Country of residence** – In which country do you reside?

Select a country

---

**Task difficulty Lewis, J.R. (1995)** *Please evaluate the following statements: 1 – Strongly disagree 7-Strongly agree*

---

I am satisfied with the ease of completing the survey.

I am satisfied with the amount of time it took to complete the survey.

- 1- Strongly disagree              4- Neutral                      7- Strongly agree  
2- Disagree                      5- More or less agree  
3- More or less disagree        6- Agree

---

**Preference expression Ding et al (2011)** *(Please evaluate the following statements: 1 – Strongly disagree 7-Strongly agree)*

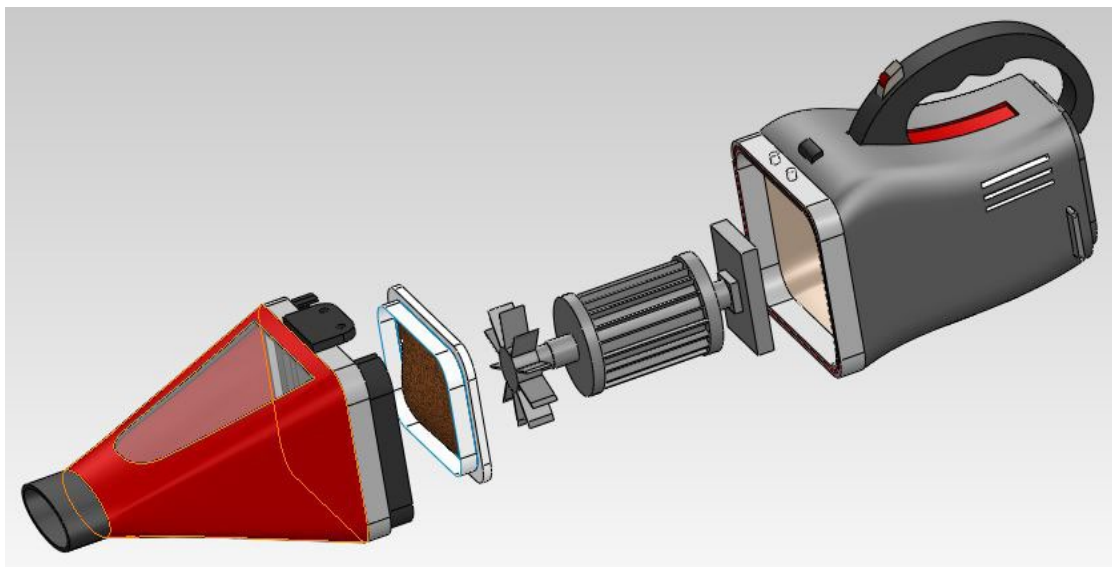
---

This survey enables me to accurately express my preference

I have enjoyed taking this survey

- 1- Strongly disagree              4- Neutral                      7- Strongly agree  
2- Disagree                      5- More or less agree  
3- More or less disagree        6- Agree
- 

**Appendix B:**



*Picture 1: Original 3-D version of the vacuum cleaner (Natarajan, 2013)*

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