MASTER THESIS

The impact of technologies in smart environments on consumer experience and behaviour

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Abstract

Nowadays, people can benefit from the newest technologies, which are developing faster than one can process. Although these new technologies like Internet of Things (IoT) devices provide many benefits, they also appear to cause scepticism and fear among society, thereby reducing the acceptance.

This research is focusing on perceived usefulness and trust, which possibly affect acceptance of IoT devices. Manipulating perceived usefulness was done through the use of differently designed explanation animations. In addition, trust was manipulated through the use of voice-over in the video. In this 2 x 2 between-subjects design, 100 respondents participated. After watching either one of the four conditions, the participants filled out a questionnaire, which investigated whether these factors actually influence trust and perceived usefulness, leading to an influence on the acceptance of an IoT device, in this case, a Smart Speaker (Google Home Mini). Afterwards, participants performed a number of tasks with the Google Home Mini, in order to find out how easy the usage of the product appeared to be.

The research question for this research stated: To what extent do ‘design of explanation’ and voice-over influence the perceived usefulness, trust & acceptance of a Smart Speaker (IoT device)? The results of the research showed that an extensive animation style with visual elements influences the attitude evaluation regarding the product visualized in the video. Also, it showed that people develop a more positive attitude towards the product because the level of perceived usefulness was changed due to the animation. This means that in this case, perceived usefulness works as a mediator between animation style and attitude. In other words, people seem to perceive the product as more useful after seeing the richer animation style in the explainer video, causing a more positive attitude. 'Design of explanation' also appeared to cause an improved perceived and actual performance among respondents, meaning that watching a video containing an improved design causes people to perform tasks with the visualised product better, and perceive it as easier as well.

Keywords: smart home device, smart speaker, perceived usefulness, trust, attitude, intention, technology acceptance

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Introduction

The basic idea of the Internet of Things (IoT) is the omnipresence of a variety of things or objects around us – such as Radio-Frequency Identification (RFID) tags, sensors, actuators, mobile phones, etc. – that can interact with each other and work with their neighbours to achieve common goals through unique addressing schemes (Giusto et al., 2010). These information and communication systems become invisibly embedded in our environment. The result of this is a huge amount of data that can be processed, stored and presented, in an efficient and easily interpretable way (Gubbi et al., 2013).

The theme of this research is; 'The impact of technologies in smart environments on consumer experience and behaviour'. Nowadays, there seems to be a gap between the technological improvements that are occurring, and the readiness of consumers to use these applications. Finding out what the possible reasons for this gap are, could be of scientific and practical use, for developers as well as users of for example technological IoT-devices.

Prior research by Sicari et al. (2015) points out that while the IoT has gained momentum over the previous years, the security, particularly trust, has become one of the biggest challenges. IoT Applications such as smart home devices make use of sensors, which recognize one's presence in a house, giving them the ability to turn the lights on and off. In the meantime, information is being gathered while being in our main personal domain; our house. Fact is, that as a user, automated communication takes place, in which the user does not participate actively. We expect the device to act on our behalf and we rely on that. Though this personally identifiable information (PII) is not processed by a human being, who is the original owner of the PII. Instead, it is processed, for instance, by the smart home device's cloud-database. The phenomenon of personal data being stored and used is not new, looking at for instance medical records, etc. but there are some remarkable differences. First, PII exchange between IoT devices is not regulated in a way that healthcare data is currently regulated. Secondly, IoT devices make a direct impact on our daily and personal life. The devices that make use of the information, are embedded in our daily life. These devices are for example in our house, or we use them as wearables (Daubert, Wiesmaier & Kikiras, 2015). What can be concluded, is that throughout the years, trust has become a more and more relevant topic when it comes to technological developments. This can also be seen in existing technology acceptance models. Researchers appear to include trust and risk in their existing models, in order to get a better understanding of consumers and their trust and risk perceptions. Pavlou, (2001) For example, decided to implement trust in the technology acceptance model. This was done because of the fact that online environments are less personal and because of the fact that technology brings a level of unpredictability. This results in a reduction of perceived control by users. This makes trust an important component of technology acceptance. A practical example by Kesharwani & Singh Bisht (2012) reveals that trust has a negative impact on perceived risks. Designing a website very well was found to be minimizing the perceived risk, and minimizing the concerns regarding the use of the product. This implies that risk is manipulatable. In the theoretical framework, it is further explained how the use of a voice-over in an animation video can manipulate trust.

Another factor that influences acceptance and which appears to predict behaviour is perceived usefulness. According to Prayoga & Abraham (2016), people that have the intention to use a certain technology, often end up finding the technology more useful and appear to use it to a larger extent. Perceived usefulness can be considered as the extent of believing that a technological application is helping them, or will be enhancing their performances. In the context of IoT, that means that the device should be helpful to achieve their goals, followed by a bigger change of acceptance towards the product. According to Tarzey & Fernandes (2015), IoT has already been around for several years and has been scaling out to millions of devices and organisations. Despite this fact, the estimation of the impact appears to lack behind. Most people think that IoT devices will have a big influence in the near future, and another group who is slightly smaller thinks that IoT is ‘overhyped’ or will not impact them or their organisation. In addition, research says that half of the sceptics of IoT devices in organisations do not have dedicated budget plans for IoT devices at all. Perceived usefulness appears to play an interesting role in the acceptance of IoT devices. In the theoretical framework, a further elaboration takes place regarding the use of design, in order to manipulate perceived usefulness.

With the recent advances in internet technologies, IoT technology is increasingly impacting our daily lives and starting to provide interesting and advantageous new services. Gao & Bai (2014) performed research which aimed to assess the acceptance of IoT technology among users through a newly developed model. Perceived ease of use and trust seem to affect perceived usefulness. The new model explores the driving factors of individuals’ willingness to use IoT technology. Park et al. (2017) also did research on the acceptance of IoT devices. It assesses many factors, such as motivation, compatibility, connectedness and control. The writer also states that it can serve as a foundation for future studies on improving IoT devices, by considering user experience.

Based on the above text, it can be stated that a lot of research has been done in the field of IoT. However, much research is concerned with the general acceptance of IoT devices in daily life. In addition, research is being conducted into quality expectations and various models are being developed to improve the design. A research gap seems to have arisen around perceived usefulness and trust, which possibly affect acceptance of IoT devices.

The role of trust and perceived usefulness towards acceptance will be assessed in this research. The theoretical framework elaborates further how these manipulations were formed. Manipulating perceived usefulness will be done through the use of differently designed explanation animations. In addition, trust will be manipulated through the use of different voice-overs in the video. By subsequently taking a questionnaire, it can be investigated whether these factors actually influence trust and perceived usefulness, leading to an influence on the acceptance of an IoT device, in this case, a Smart Speaker.

In the theoretical framework, it has become clear that 'design of explanation' and voice-over are both possibly related to perceived usefulness and trust. Therefore, 'design of explanation' and 'voice-over' are used as the independent variables in this research. This has led to the following research question: 'To what extent do 'design of explanation' and voice-over influence the perceived usefulness, trust & acceptance of a Smart Speaker (IoT device)?' In this research question, the independent variables are 'design of explanation' and 'voice-over', which are related to the dependent variables 'usefulness' and 'trust', which mediate towards 'acceptance'.

2. Theoretical Framework

The theoretical framework is divided into two sections. In 2.1, the predictors of acceptance are taken into account, which are perceived usefulness and trust. The related independent variable is immediately discussed with both. In 2.2, performance is discussed. Based on the findings in this theoretical framework, a final model (2.3) is designed that is suitable for this specific case. In section 2.4, conclusions are drawn.

2.1 Predictors of acceptance

2.1.1 (Independent variable) Design of explanation

Relatively old studies were already focussed on predicting user acceptance of technological applications, such as computers. Research shows that perceived usefulness and perceived ease of use are fundamental determinants of user acceptance. Perceived usefulness significantly correlates with both self-reported current usage and future usage (Davis, 1989).

More recent research, regarding the smart home market, shows similar results. By analyzing factors that are affecting the adoption and diffusion of smart homes, they identified antecedents of acceptance of smart home devices. This was done by using a technology acceptance model that described the adoption of smart homes. It resulted in significant positive effects on purchase intention by for instance perceived usefulness (Shin, Park & Lee, 2018). This is also supported by Keil, Beranek & Konsynski (1995) who state that usefulness and ease of use (EOU) are both important factors of determining the acceptance and also the usage of, in this case, digital information systems. In addition, non-users appear to see less usefulness of smart speakers than people who have used one of these devices before (Lau, Zimmerman & Schaub, 2018).

To get a better understanding of a problem or a situation, one requires a rich and comprehensive view of information in a certain context (Daft and Lengel 1986; Daft, Lengel & Trevino, 1987; Weick, 1979). Using, for example, a rich presentation makes it easier to develop a mental picture of a certain context around the information. Using multimedia provides a better perspective than a leaner medium, as for example, text (Lim & Benbasat, 2000). Lim & Benbasat (2000) also state that when a task is not easy to analyze on forehand, that people will perceive a visual media representation to be more effective than a text-based representation, in terms of equivocality. This results in people perceiving multimedia presentations as being more useful. One of the most important aspects of processing fluency is visual complexity (Creusen, Veryzer, and Schoormans, 2010). Factors that influence visual complexity are, for example, irregularity, detail, quantity and dissimilarity (Kent & Allen, 1994; Pieters, Wedel & Batra, 2010). Other important factors are the variations in colour and contrast (Leder & Carbon, 2005). In addition, studies show that visuals complexity, in this specific case in a service environment, influences perceived attractiveness (Orth & Wirtz, 2014). Therefore, visual complexity is an important feature of the animation style that is used for this research. Based on this, visual complexity is used as one of the constructs in the pre-test. Questions regarding visual complexity will be asked, in order to determine the eventual design style for the eventual research.

To determine which type of design is suitable for testing perceived usefulness, more information is needed about what determines whether something visually "works" or not. Process fluency is a concept that comes with this. Processing fluency can be explained as the subjective experience of the speed and ease with which incoming stimuli are processed (Reber, Winkielman & Schwarz 1998). People tend to monitor the speed and ease of extracting meaning for a certain stimulus (Schwarz, 2004). Therefore, it is considered an important information source. It often triggers a previously encountered experience, which makes the stimuli more likely to be seen as 'good-natured' (Winkielman et al. 2006). Because of this, a high fluency is connected to a positive reaction towards the stimulus (Reber, Schwarz, and Winkielman 2004). People can often not point out the relation between their positive reaction and the stimuli, which results in greater attractiveness (Schwarz, 2004). In addition, other research proposes that stimulus characteristics and presentation factors, together with repetition, determine the amount of processing fluency that occurs (Janiszewski & Meyvis, 2001). Besides that, trust also has a link with processing fluency. According to Tang, Jang & Chiang (2014), processing fluency has a significant impact on the trustworthiness of information. This means that while enhancing the processing fluency, the level of trust also gains. This means that for instance when focussing on design, processing fluency should also be taken into consideration, to make sure that their attempt to persuade is working effectively. Based on this information, processing fluency is used as one of the constructs in the pre-test, in order to determine which design style is used for the actual research.

In other words: the way that information is formulated, designed, or framed, could affect the perceived usefulness. This results in the following manipulation. By 'design of explanation', we mean the way in which the explanation of the product is designed. The first manipulation will be an animation video in a standardized format. It contains explanatory information, in a simple plain, black and white text. There are no added visual aspects that support the given message or make the animation look nice. In the second manipulation, the explanation of the product is done via an animation video, designed in the style of the product. This video contains graphical aspects such as colours, shapes and icons. By showing either one of the two videos to participants, "design of explanation" is manipulated as an independent variable. This leads to the following four hypotheses:

H1: "'Design of explanation' in an explanatory animation video positively affects peoples' attitude towards Smart Speakers, compared to not improving 'design of explanation'."

H1b (mediated): "The effect of 'design of explanation' is mediated by perceived usefulness, which positively affects people's attitude, compared to not improving 'design of explanation'."

H2: "'Design of explanation' in an explanatory animation video positively affects peoples' intention towards using Smart Speakers, compared to not improving 'design of explanation'."

H2b (mediated): "The effect of 'design of explanation' is mediated by perceived usefulness, which positively affects people's intention, compared to not improving 'design of explanation'."

2.1.2 (Independent variable) Voice-over

Many non-users of smart speakers do not trust speaker firms. Users, on the other hand, express few concerns about privacy, but their rationalizations indicate an incomplete understanding of privacy risks, a complicated relationship of trust with speaker companies, and dependence on the socio-technical context in which smart speakers find themselves in (Lau et al., 2018). Previous research has shown that trust has an effect on behavioural intention (Gu, Lee, & Suh, 2009). It shows that alongside 'usefulness', 'trust' is one of the three biggest predictors of behavioural intention, in this example for the use of mobile banking.

When people hear a voice which they have never heard before, one immediately forms an impression of the personality of this person (McAleer, Todorov & Belin, 2014). They also state that either if these impressions are correct or not, it appears that it still affects people subsequent interactions. Looking at voice-over voices in videos, this appears as very relevant information.

Alburger (2012) states that using a voice-over is a way of storytelling that uses a combination of interpretation, intonation, attitude and acting skills. A voice-over connects on an emotional, often unconscious level. It draws the listener into a story and makes them relate to the topic. According to Mehrabian (1971), there are three elements which indicate if we like a person who sends a message. This contains for 7 percent out of words, 55 percent body language and 38 percent tone of voice. When using a voice-over, body language is not present, making the tone of voice an even bigger part of the impression someone makes. Mehrabian (1971) believes that a receiver is more likely to trust the form of communication, due to the non-verbal impact of eg. tone of voice. Besides trust towards the IoT device, there is also the concept called 'self-efficacy' which measures trust that someone has towards themselves, to a certain extent. When a task is explained in an animation video, it is also interesting to know whether people consider themselves as capable of accomplishing the task.

With this knowledge, one could say that using a certain tone of voice could possibly affect someone's trust towards this person or the video to which it is related. It could also affect a persons' self-efficacy since this is also a trust-related concept. In one situation, participants will see the animation video without the voice-over sound being added. In the second manipulation, a voice-over is added. The voice explains what's being displayed on the screen and leads the viewer through the animation. By showing participants either one of the two situations (with or without voice-over), a manipulation is created. This makes the voice-over the second independent variable. Based on this information, the following hypotheses are formulated:

H3: "Using a voice-over in an explanatory animation video positively affects people's attitude towards Smart Speakers, compared to not using a voice-over."

H3b (mediated): "Using a voice-over in an explanatory animation video is mediated by trust, which positively affects peoples' attitude towards Smart Speakers, compared to not using a voice-over."

H3c (mediated): "Using a voice-over in an explanatory animation video is mediated by self-efficacy, which positively affects peoples' attitude towards Smart Speakers, compared to not using a voice-over."

H4: "Using a voice-over in an explanatory animation video positively affects people's intention towards using Smart Speakers, compared to not using a voice-over."

H4b (mediated): "Using a voice-over in an explanatory animation video is mediated by self-efficacy, which positively affects peoples' intention towards Smart Speakers, compared to not using a voice-over."

H3c (mediated): "Using a voice-over in an explanatory animation video is mediated by self-efficacy, which positively affects peoples' intention towards Smart Speakers, compared to not using a voice-over."

2.2 Performance

Besides finding out if the use of a voice-over and design of explanation influence attitude and intention, and if they are mediated through either one of the named constructs, we also want to know more about the performance with the actual device. Therefore, we look at two different concepts: the perceived performance, in which participants assess how they look back on how hard or easy the task was to perform. Second, the actual performance. In this construct, we count the score on how good the participant actually performed on the task. To found out if voice-over and design of explanation play a significant role in how well participants perform the task, we formulate the following hypotheses:

H5: “Using a ‘Design of explanation’ in an explanatory animation video positively affects people's perceived performance with a Smart Speaker, compared to not using a voice-over.”

H6: “Using a ‘voice-over’ in an explanatory animation video positively affects people's perceived performance with a Smart Speaker, compared to not using a voice-over.”

H7: “Using a ‘Design of explanation’ in an explanatory animation video positively affects people's actual performance with a Smart Speaker, compared to not using a voice-over.”

H8: “Using a ‘voice-over’ in an explanatory animation video positively affects people's actual performance with a Smart Speaker, compared to not using a voice-over.”

2.3 Final model

Based on this information, a model was made with different predictors. Design of explanation and the voice-over affect perceived usefulness and trust, resulting in perceived usefulness and trust affecting acceptance. The whole model can be seen in Figure 1.

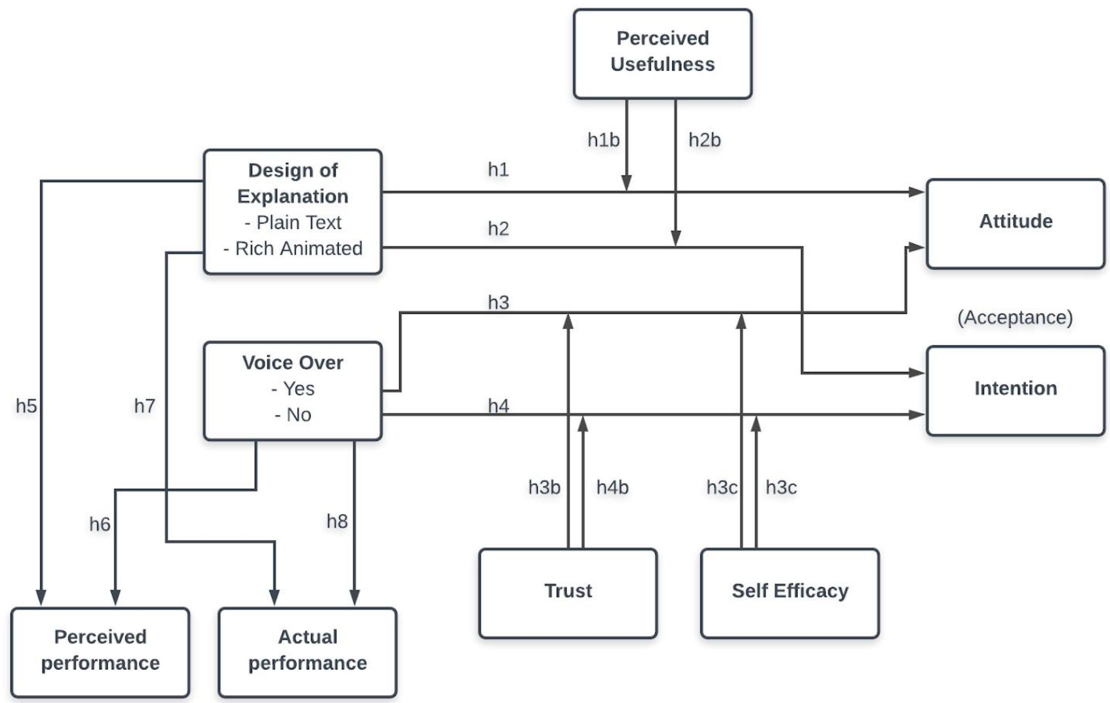

Figure 1: Research Model on Acceptance

2.4 Conclusion

The goal of this study is to find out to what extent 'design of explanation' and 'voice-over' influence the perceived usefulness and trust, which influence acceptance of a Smart Speaker (IoT device) to a certain extent. Looking at the hypotheses, it is expected that improved design of explanation positively affects acceptance. This effect could be mediated through perceived usefulness. Second, the use of a voice-over should also positively affect the acceptance towards Smart Speakers. This effect could be mediated through trust and/or self-efficacy.

Besides this, it is also expected that both manipulation positively affects actual and perceived usefulness.

3. Method

3.1 Participants

In order to ultimately be able to properly compare the results, and to be able to properly measure the factors that influence acceptance, the participants which were used had to be, to a certain degree, similar. To ensure that there were as few biased opinions as possible and to prevent participants from being unable to estimate the usability of the product, it was decided to use the following defined group: A group of participants consisting of both men like women, who do not own a Smart Speaker themselves, but who are aware of the existence of the product / similar products. In the end, this research contained 100 participants, of which 51 percent were men, and 49 percent were women. The mean age of the participants was 27,07 ($S = 9{,}320$). As being said, the participants were selected based on the fact that they do not own a smart home device but were aware of the existence of products as such. In order to find out more about the experience with smart home devices of the participants, they were asked whether they have used a similar device before. The biggest group of respondents (81%) said that they did not use a smart home device before, while a much smaller group (19%) stated that they used a likewise product before. An overview of the demographics of this participant group can be found in table 1.

Table 1. Demographics across the conditions

Condition	N =	Age	Gender	Education
1: Rich animation, no voice-over	25	M= 28, SD = 11.05	32% (m) / 68% (w)	20% (low) / 80% (high)
2: Rich Animation, voice-over	25	M = 27, SD = 8.06	68% (m) / 32% (w)	4% (low) / 96% (high)
3: Plain animation, no voice-over	25	M = 26, SD = 9.84	36% (m) / 64% (w)	20% (low) / 80% (high)
4: Plain animation, voice-over	25	M = 27, SD = 8.47	68% (m) / 32% (w)	12% (low) / 88% (high)
Total	100	M = 27, SD = 9.32	51% (m) / 49% (w)	14% (low) / 86% (high)

3.2 Research Design

The aim of the research was to find out to what extent 'design of explanation' and the use of voice-over influence the perceived usefulness, trust & acceptance of a Smart Speaker. Therefore, an experiment was conducted. This was done by allowing participants to participate in an experiment in which various variables were manipulated. All participants filled out a questionnaire after the experiment. The research design is shown in figure 2. It defines several experimental conditions, which were afterwards measured in a survey.

The design that was used for this research is a '2 x 2 between subjects' design. This means that the research contained four conditions. In the first condition, the video contained a plain animation, which only displays text in a standard black and white format. The second condition contained an animation video that is well-designed in the corporate identity of the product, containing icons, pictures and other visual aspects that support the animation. This is the first variable that was being manipulated. It was done in order to manipulate perceived usefulness, as explained in the theoretical framework. The second variable that was being manipulated was the voice-over. Participants who watched either one of the two animation formats watched this with, or without a voice-over that served as guidance through the animation. In this way, trust was manipulated, as explained in the theoretical framework. These four possible conditions were randomly assigned to the participants.

The IoT devices that were taken into account for this research are Smart Speakers. Smart Speakers, also referred to as Environmental Control Units (ECU) or Natural User Interfaces (NUI), are devices or systems that give people the opportunity to control their technological applications in their home or working environment. It is also often utilized by people with some sort of disability, to enhance the ability to have digital control within their environment, or to promote independence and improve the quality of life (López, Quesada & Guerrero, 2017; Noda, 2017). Popular examples of Smart Speakers are Amazon Alexa, Google Home, Google Nest Hub, and such.

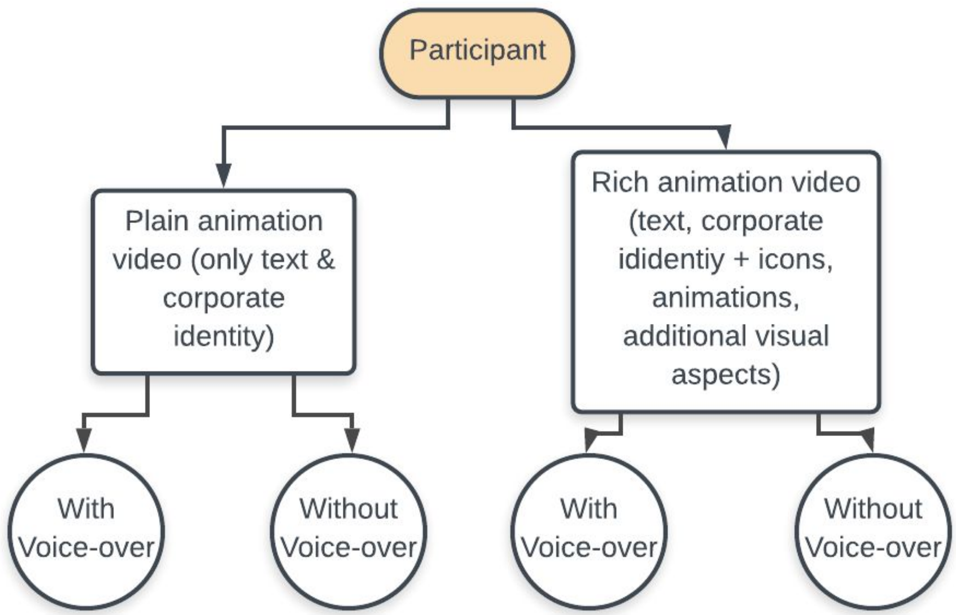

Figure 2: Research Design

3.3 Pretest

The pre-test examined which voice-overs are experienced as trustworthy and which were not. Different voices (gender, age, tone of voice) were listened to by the participants. After hearing these voices, a survey was conducted, in which questions about trust were asked. This showed which voice is suitable to use in the actual research, in order to manipulate trust. The source credibility scale by McCorskey and Teven (1999) was used and adjusted for the questions. Only the relevant items from the 'Trustworthiness' and 'Competence' dimension were included, which are 'honest','trustworthy', 'genuine', 'expert', 'intelligent' and 'competent'. A full list of all voices that were tested can be found in Appendix A, Table 5.

In addition, the same was done for perceived usefulness, by showing different animations. Three different animation styles (for example; style, use of colour, branding, use of icons etc.) were shown to the participant. The participants watched the three short animated videos which all have their own different style, as can be seen in Appendix B, Table 7. These videos all briefly explained the working of a Google Home Mini device. In order to assess the processing fluency and visual complexity of the animation styles, questions of research by (Orth & Wirtz, 2014) and (Davis, 1989) were adapted and adjusted to the context of this research. By filling out a survey with questions about processing fluency and visual complexity of the animation styles, it was discovered which style fitted the best to testing perceived usefulness for the Smart Speaker. See Appendix A & Appendix B for the results of all the tested items of both pre-tests.

The final voice-over that is being used is the voice of Boet, an older male voice. The animation style that is finally being used is the style of the first video, which contains a blue and grey style, supported by 2D animations of icons and a Google Home Mini illustration.

The final 4 different conditions can be seen here:

Plain animation (with voice-over): https://www.youtube.com/watch?v=loUdkdBfbhU

Plain animation (without voice-over): https://www.youtube.com/watch?v=elEPKdcJfRU

Rich animation (with voice-over): https://www.youtube.com/watch?v=niYa44H44ko

Rich animation (without voice-over): https://www.youtube.com/watch?v=Drai0z1AFEM

Comparison video (both animation styles): https://www.youtube.com/watch?v=5cjMKurpyRQ

3.4 Stimuli

The research was conducted in one of the experimental rooms at the University of Twente. Participants were assigned to either one of the four conditions. The participant received a package which contains the Google Home Mini, a lower budget smart home device. The participant was asked to start playing the animation video. The script of the video can be found in Appendix C. This video contained either a rich or plain animated video, with or without voice-over, depending on their assigned condition. After the participant watched the video, they were asked to perform the tasks that were shown in the video, which were adjusting the volume of the device, asking the device if it will rain today, and to set an alarm on the device. Figure 3 and Figure 4 show examples of the plain animated video versus more richly animated video.

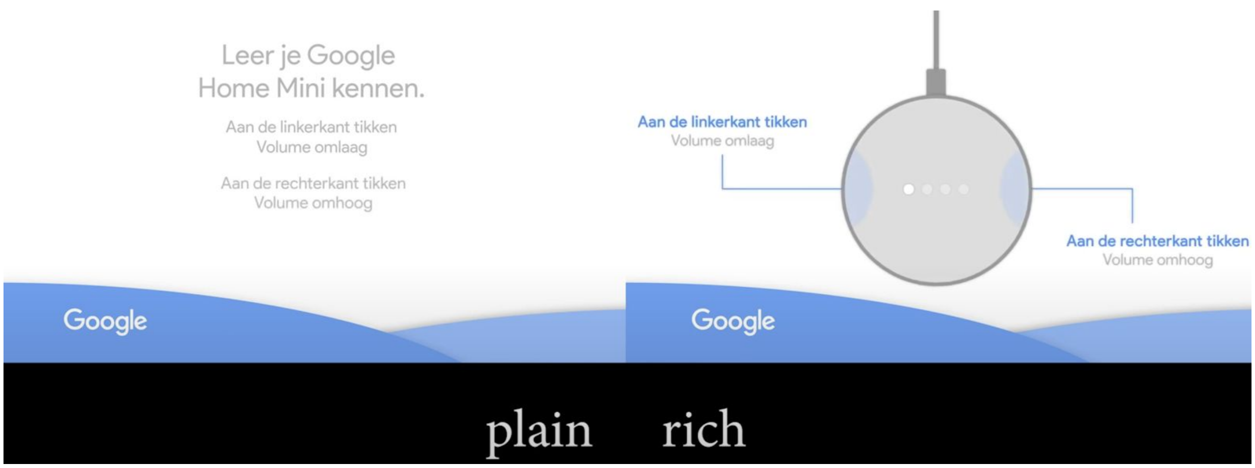

Figure 3: On the left side, you see a plain text animation, while the right side contains different fonts, sizes, colours and 3D objects/highlighted areas.

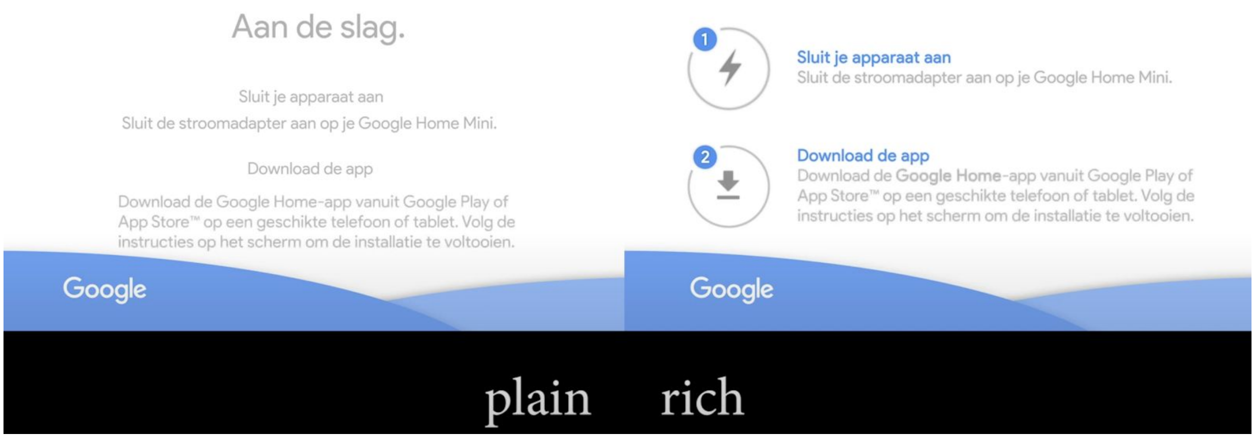

Figure 4: On the left side, you see the plain text animation, while the right side is well-arranged, divided into steps and contains a clear style.

3.5 Procedure

The 100 participants were randomly assigned to one of the four conditions: Plain animation without voice-over, plain animation with voice-over, rich animation without voice-over and rich animation with voice-over. Every participant entered an approximately 15-minute session. In this setting, the researcher explained that they are entering research regarding smart home devices.

Prior to the actual start of the research, the questionnaire asked the participant about prior knowledge about smart home devices and if they had ever used or owned one themselves. This was done, to make sure that the participant matched the requirements stated in 3.1 participants. Then, in the opening statement of the survey, the informed consent requirements were mentioned and the participants had to accept those. This statement contained information regarding anonymity of participation and the freedom of pausing or quitting the research. After watching either one of the four videos, participants completed a survey with questions related to the moderators; perceived usefulness, trust and acceptance of a Smart Speaker device. This is further explained in the 3.6 Questionnaire section.

After filling out the survey, the participant got the change to use the device. The Google Home Mini was pre-programmed, in order to make it work ‘plug-and-play’, as shown in the animation video. The participants performed the three tasks that are shown in the video. These tasks were divided into a physical task and a task that was performed through speech. First, the participant was asked to adjust the volume, by pressing the buttons on the outside of the device, as displayed in the video. Secondly, the participant was asked to find out if it will rain on this particular day. This requires a voice command, in which the participant asked the Google Home Mini about the weather. Lastly, the participant was asked to set an alarm at a given time. While doing this, the participant was free to replay the video or to pause and play the video. In this way, they could learn how the product works at their own pace, with the assistance of the video. This approximately took a few minutes. After performing these tasks, a few more questions were asked, about how hard or easy they found the tasks to complete.

After the survey was completely filled out by the participants, a debriefing by the researcher took place, in which the underlying goal (measuring acceptance through trust and perceived usefulness) was explained. Furthermore, they were asked to write down their email, to get information about the results of the research. An overview of the survey workflow can be found in Figure 5.

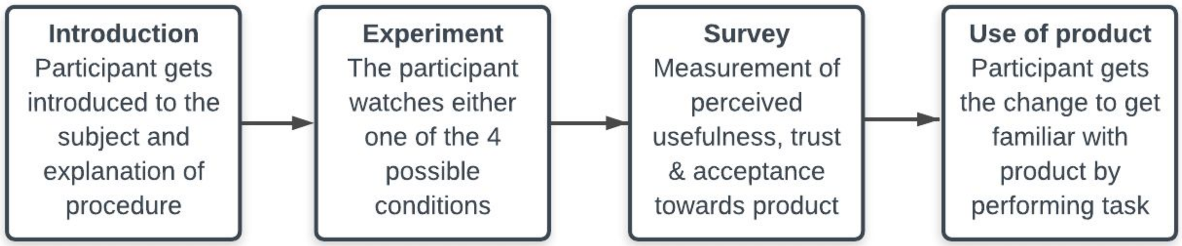

Figure 5: Survey flow

3.6 Questionnaire

Right after the participants watched the animation video and conducted a few tasks with the Google Home Mini device, they filled out a questionnaire, which is visible in Appendix D. The questionnaire was divided into several sections, measures with different scales: the level of trust towards smart home devices, the perceived usefulness of smart home devices, and the general acceptance of a smart home device. All constructs were separately tested in terms of reliability. An overview of this can be found in Table 2.

Perceived Usefulness

To assess the perceived usefulness of the smart home device, the Scale Items for Perceived Usefulness are used (Davis, 1989). These items were used in previous research, in order to assess the perceived usefulness of information technology. The items of this research were adapted and adjusted towards the Google Home Mini. The original research assesses the perceived usefulness of technology in general in a work environment. This is adjusted towards performing tasks with a smart home device. The items were measured on a 5-point Likert scale, ranging from ‘totally disagree’ to ‘totally agree’. The questionnaire included statements such as: ‘A Google Home Mini enables me to accomplish tasks more quickly’. The reliability of this construct was relatively high, with Cronbach's alpha = .84. The perceived usefulness of the smart home device was generally perceived as slightly above 'neutral' (M = 3.17, SD = .64), with mean scores ranging from 2.79 to 3.54. The complete list of all 8 statements can be found in Table 8 in Appendix D, also containing the means and standard deviations.

Trust (& Self Efficacy)

In order to assess the level of trust someone has towards a smart home device, several items of different previous research were used. Research showed that trust is more and more integrated in technology acceptance models. For example, Agag & El-Masry (2016), who integrated Technology Acceptance Model with trust, in order to understand the consumers' intention in participating in online communities. This also goes for Gefen et al. (2003), who also added trust to the Technology Acceptance Model, assessing online trust, in an environment that lacks the typical human interaction, which has similarities with interacting with a smart home device. Therefore, questions of both pieces of research were adapted and adjusted towards the context of this research. The items were measured on a 5-point Likert scale, ranging from 'totally disagree' to 'totally agree'. It contained statements such as 'I do not doubt the honesty of Google home Mini devices'. This construct is perceived as reliable (Cronbach's alpha = .63), although it didn't reach 0,70, due to the low number of items (5), we still consider this construct as reliable. The level of trust towards smart home devices was perceived between neutral and agree (M = 3.36, SD = .58). It contained mean scores ranging from 2.78 to 3.71. All 5 constructs can be found in Table 9 in Appendix D, which also show the remaining means and standard deviations.

Besides trust towards the IoT device, there is also the concept called ‘self-efficacy’ which measures trust that someone has towards themselves, to a certain extent. When a task is explained in an animation video, it is also interesting to know whether people consider themselves as capable of accomplishing the task. To measure this concept, relevant parts of the Modified MSLQ (Artino and McCoach, 2008) were adapted. Where the original MSLQ (Pintrich, Smith, Garcia, & McKeachie, 1993) measured motivation and learning strategies, the modified version by Artino and McCoach (2008) also includes task value, self-efficacy and anxiety. Relevant statements that were used in the self-efficacy section were adapted and adjusted towards this research context and can be found in the ‘trust’ section of the questionnaire. This construct reached a relatively high level of reliability (Cronbach’s alpha = .86). Self-efficacy was generally answered just under ‘agree’ (M = 3.95, SD = .64). It contained mean scores ranging from 3.57 to 4.21. All 4 items and their means and standard deviations can be found in Appendix D, under table 9.

Acceptance (Attitude & Intention)

Besides trust and perceived usefulness, the general acceptance of the smart home device will also be measured. This was also done, to compare if the acceptance of the device is mediated through either perceived usefulness or trust. To measure the acceptance of the IoT device, parts of the Technology Acceptance Model (TAM) were adapted. The two closely related constructs to acceptance, are attitude and intention. The Technology Acceptance Model was originally proposed by Davis (1989), Davis (1993), in order to address why users reject or accept certain information technology. It is an adaption of TRA, which stands for Theory of Reasoned Action

(Fishbein & Ajzen, 1975) which explains and predicts people's behaviour in specific situations. The theory states that ease of use and perceived usefulness are the two key concepts that influence people's intention and attitude, which lead to the actual usage of a technological application. Therefore, in order to measure acceptance, questions regarding intention and attitude were included in the questionnaire. The questions that were used in order to measure these constructs were adapted and adjusted from recent research by Manis & Choi (2019), who used the TAM in order to measure acceptance of virtual reality hardware. An example of one of the questions that were asked, regarding intention, states: "I intend to purchase a smart speaker, like the Google Home Mini within the foreseeable future." Another example, of one of the questions assessing attitude, is: "My impression of a smart speaker, like the Google Home Mini, is (answered on 5-point Likert scale): Very Bad - Bad - Neutral - Good - Very Good". 'Attitude' as a construct appeared reliable (Cronbach's Alpha = .79), with a mean score between 'neutral' and 'agree' (M = 3.38, SD = .54). The construct existed out of 5 different items, with mean scores ranging from 3.04 to 3.62. In Appendix D, Table 10, the results per item can be found. Besides attitude, the reliability of 'intention' as a construct was measured. This construct showed a high level of reliability (Cronbach's Alpha = .95). It had mean scores ranging from 2.40 up to 3.14. This construct contained out of 4 items, in which participants answered slightly under 'neutral' (M = 2.76, SD = .98). All items and their individual scores can also be found in Appendix D, Table 10.

Perceived performance

Additional to the previously mentioned constructs to measure acceptance, we add another construct in this section. After the participants performed the tasks with the Google Home Mini, they filed out 3 more questions, in which they assessed how easy or difficult it was for them to perform these tasks. One example question of this construct was ‘Finding out if it will rain today through the Google Home Mini was easy for me to do’ which was answered on the same 5-point Likert scale as all the other previous constructs. This construct consisted of 3 items, which were all assigned to a single task that was performed. The construct was found reliable (Cronbach’s Alpha = .65). The mean scores of the items varied between 3.77 and 4.04. The participants answered the questions slightly under ‘agree’, which is quite high (M = 3.94, SD = .76). An overview of all items and their individual scores can be found in table 11, Appendix D.

Actual Performance

The last construct that is added, is actual performance. While the participants performed the tasks with the Google Home Mini, the researcher observed the participants. All the three tasks were divided into 3 steps, which allowed the participants to get a maximum of 3 points per task and a total of 9 points. The steps in the second task, asking the device if it will rain today, was divided in the following 3 steps: participant uses a voice command (1), the participant uses the right command (2), Google Home receives command; right response follows (3). The construct consisted of 3 items, all assigned to one of the tasks. The construct was not found reliable (Cronbach’s Alpha = .48), because the first question regarding adjusting the volume was answered very divergent to the rest of the questions. Leaving this question out would cause a

Cronbach's Alpha of .65. But the question is not taken out of the analysis, since we take a look at all 3 questions on their own, and the sum of the questions. All scores regarding the actual performance can be found in Appendix D, Table 12.

Table 2: Reliability scores, means and standard deviations per measurement scale

Variables	Number of items	Cronbach's α	M	SD
Perceived Usefulness	8	.84	3,17	,64130
Trust	5	.63	3,36	,57888
Self Efficacy	4	.86	3,95	,63966
Attitude	5	.79	3,38	,54465
Intention	4	.95	2,76	,97588
Perceived Performance	3	.65	3,94	,76055

4. Results

The data was analyzed, by using a 2 x 2 between-subjects design. This data consisted of 2 (animation style: plain design vs. rich design) x 2 (voice: voice-over vs. no voice-over).

4.1 Intention & Attitude

An ANOVA (univariate GLM) was performed to test whether the animation and voice-over manipulations within the video show an effect on the respondents' attitudes. In this test, the animation and the voice-over are the independent variables and the attitude (mean score of the construct, consisting of 5 items measuring 'attitude') of the respondents was the dependent variable.

The main effect of the animation appeared significant ($F(1,96) = 10.21$, $p = < .01$), which indicates that a rich animation style within the video causes a more positive attitude towards the displayed IoT device ($M = 3.55$, $SD = .55$) than the plain animation ($M = 3.22$, $SD = .49$). Contrary to what was expected, the effect of using a voice-over does not appear to have a significant effect on attitude ($F(1,96) = 0.78$, $p = 0.38$). The same goes for the interaction effect, which also did not appear significant ($F(1,96) = 1.82$, $p = 0.18$).

A second ANOVA was performed to test whether the two manipulations (animation and voice-over) show an effect on the respondents' intention to use the product (or a similar product) that was shown in the video. Again, animation and voice-over were used as the independent variables, while this time, the respondents' intention (mean score of the construct, consisting of 4 items measuring 'intention') was the dependent variable.

Firstly, significance was not reached, looking at the effect of animation on the intention of the respondents ($F(1,96) = 2.31$, $p = 0.13$). This means that there is no main effect of animation on intention. The same applies to the effect of voice-over on intention, which has not reached significance either ($F(1,96) = 0.91$, $p = 0.34$). Both independent variables, therefore, have no main effect on the intent of the respondent. This is the same for the interaction effect, which also appeared not to be significant ($F(1,96) = 1.35$, $p = 0.25$).

4.2 Perceived Usefulness

The main effects of the animation style and the use of a voice-over on the perceived usefulness of the product shown in the video, both reached a level of significance. Firstly, the main effect of animation style on perceived usefulness reached significance ($F(1,96) = 8.77$, $p = < .01$). This indicates that using a richly designed animation causes that respondents perceive the displayed product in the video as more useful ($M = 3.35$, $SD = .73$) than when the design in the video contains a plain design ($M = 3.00$, $SD = .49$).

Second, the main effect of the use of a voice-over on perceived usefulness reached significance as well ($F(1,96) = 10.35$, $p = 0.002$). This shows that the use of a voice-over in the video increases the perceived usefulness of the respondents towards the displayed product ($M = 3.36$, $SD = .53$), while the video without voice-over makes the product considered less useful ($M = 2.99$, $SD = .69$).

The interaction effect appeared marginally significant ($F(1,96) = 3.13$, $p = 0.08$). Inspecting the interaction plot shows that the combination of a rich animation style and a voice-over in particular increases attitude (Figure 6).

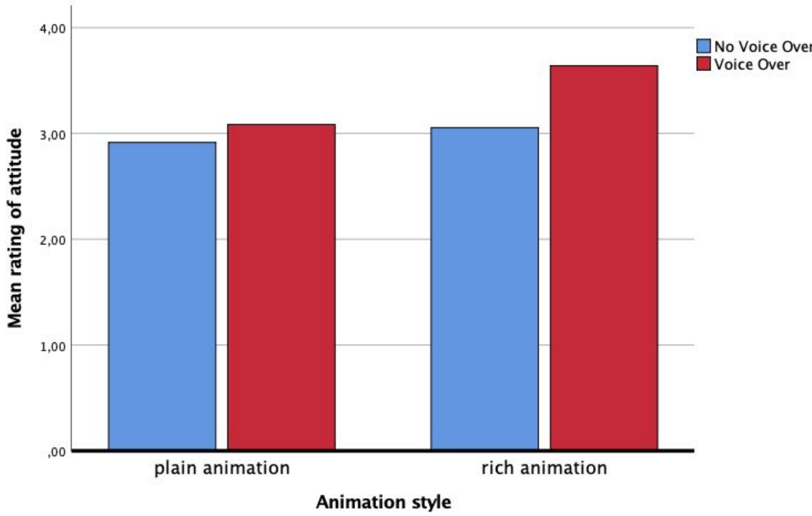

Figure 6: Interaction between perceived usefulness and attitude.

4.3 Trust & Self Efficacy

Looking at the level of trust towards the displayed product in the video, the effect of the animation appeared not to be significant ($F(1,96) = 0.54$, $p = 0.46$). Although the effect of voice-over appeared not to have a p-value <.05, we state that it is marginally significant($F(1,96) = 3.15$, $p = 0.08$). From this, it can be concluded that animation in the video has no effect on the level of trust regarding the IoT device that was shown. However, the voice-over does have a marginally significant effect on trust, saying that the voice-over in the video does affect the level of trust that a respondent has towards the visualised product. No further interaction effect was found.

Besides trust, self-efficacy was measured. The main effect of animation towards self-efficacy was significant ($F(1,96) = 4.38$, $p = 0.04$). From this, we can conclude that a richer animation contributes to the self-efficacy of the respondent in relation to using the product (M =

4.09, *SD* = .51), and a simple animation leads to a lower level self-efficacy (*M* = 3.83, *SD* = .73). The main effect of using a voice-over on self-efficacy was not significant (*F*(1,96) = < .01, *p* = 0.97) and the interaction effect was also not significant (*F*(1,96) = < .88, *p* = 0.35).

4.4 Perceived performance

Then, the effect of the design manipulations on participants' perceived performance was measured. The analysis revealed that there was a significant main effect of the animation style on the perceived performance (*F*(1,96) = 8.61, *p* = < .01); the richly animated video causes a higher perceived performance (*M* = 4.15, *SD* = .64) than the plain animation (*M* = 3.72, *SD* = .82). The effect of the voice-over on the perceived performance was not significant (*F*(1,96) = 0.34, *p* = 0.56) and the interaction effect was not significant either (*F*1,96) = 0.05), *p* = 0.82).

4.5 Actual performance

Lastly, the effect of the manipulations on the actual performance of the participants was measured. The effect of animation style on the actual performance appeared to be significant (*F*(1,96) = 9.92, *p* = <.01); this means that the richly animated video causes a higher actual performance (*M* = 2.68, *SD* = .39) than the plain animation (*M* = 2.38, *SD* = .54). The effect of the voice-over on the actual performance was not significant (*F*(1,96) = 0.59), *p* = 0.44) and neither was the interaction effect (*F*(1,96) = .39, *p* = .53).

4.6 Mediation analysis

Given that there are main effects of animation style on both attitude and perceived usefulness, we want to know whether the effect of animation style on attitude (dependent variable) is mediated by perceived usefulness (the mediator). This would mean that the attitude of participants becomes more positive because the product is perceived as more useful. In order to find out, a mediation analysis was performed (Baron & Kenny, 1986). As already mentioned, the effect of animation style on attitude (dependent variable) and perceived usefulness (mediator) are both significant (table 3, regressions 1 and 2). To ensure that mediation takes place, the effect of animation style should no longer be significant once perceived usefulness is added to the regression analysis as a predictor of attitude. At the same time, the effect of the mediator (perceived usefulness) must be significant. This indeed appears to be the case (Table 3, regression 3). This explains, therefore, that participants have a more positive attitude towards the IoT devices because they see the product as more useful after seeing the richer animation style in the video.

Table 3: Mediation analyses

Variable	*Beta*	*t*	*p*
Regression 1 (DV: Attitude)			
Animation	.306	3.186	.002
Regression 2 (DV: Perceived Usefulness)			
Animation	.272	2.801	.006
Regression 3 (DV: Attitude)			
Perceived Usefulness	.537	6.371	.000
Animation	.160	1.897	.061

5. Discussion

5.1 Main findings & Discussion

The goal of this study was, to investigate whether 'design of explanation' and voice-over influence various factors leading to the acceptance of a Smart Speaker (IoT device). These factors were perceived usefulness, trust, self-efficacy, intention, attitude and perceived performance. These factors were examined by showing participants an animation video and manipulating the animation style and the use of a voice-over.

The results of the study show that certain components of an animated explanatory-video of an IoT product, such as "animation style" and the use of a "voice-over", influence the acceptance of the presented products within the video. For example, a more positive attitude or higher perceived usefulness can provide a better physical experience with the actual product in real life. The actual results show that the animation style in the video has a positive effect on the attitude towards the visualized product, which supports the idea of Lim & Benbasat (2000). Therefore, we accept hypothesis h1, which states that the design of explanation influences attitude. In addition, the results show that perceived usefulness mediates the effect of animation on attitude, which means that people develop a more positive attitude towards an IoT device, because one experiences the product as more useful, after seeing a rich, enhanced animation containing, for example, visual objects, ordered sections and use of different fonts/sizes and highlighted areas. This is in line with the results of previous research (Keil, Beranek & Konsynski, 1995). This means that hypothesis h1b is accepted as well, which states that the effect of design of explanation is mediated by perceived usefulness, leading to a change in attitude.

Contrary to attitude, the animation style did not appear to influence intention. This means that despite the fact that a richer animation style causes a more positive attitude, the actual intention to buy or use the displayed product does not change as a result of this. Therefore, we reject both hypotheses h2 and h2b, which state that the design of explanation influences the intention and that it would be mediated through perceived usefulness.

However, contrary to expectations, the effect of using a voice-over in the animation video did not appear to have a significant effect on the measured attitude and intention. Therefore, we reject hypotheses h3 and h4 and the related mediating hypotheses regarding trust and self-efficacy. This is not in line with previous research by Gu, Lee, & Suh (2009), which showed that trust has an effect on behavioural intention. From this, we can conclude that adjusting the voice-over did not enhance trust good enough in order to make a significant impact. Despite that, the voice-over did have a marginally significant effect on trust as a separate predictor. From this, it can be concluded that the use of a voice-over has a certain influence on the level of trust that someone has with regard to an IoT device, but that this does not necessarily contribute to a change of attitude towards the product. This could mean that "trust" does not have a major impact on people's attitudes when it comes to IoT devices, despite their level of trust changing in relation to the product. It could also mean that the use of a voice-over has only too little influence on trust (explaining the marginal significance) and therefore has no impact on attitude evaluation. This is in line with Mehrabian (1971) stating that tone of voice is enhancing trust, although the influence does not seem to be large enough in this case.

Looking at both actual and perceived performance, it seems that the ‘design of explanation’ plays an important role here. The animation style appeared to have an effect on how people perceive the difficulty of the task, but also on how they actually performed it. This means that a richer animation style leads to a better performance of the displayed tasks, but also on how the user ‘thinks’ he or she performed this task. Therefore we accept hypotheses h5 and h7, which state that design has an effect on perceived and on actual performance. Despite the fact that the design of explanation had a significant effect on both these constructs, this was not the case for the use of a voice-over. Voice-over did not appear to have an effect on either perceived or actual performance. Therefore we reject h6 and h8, both stating an effect of voice-over on these two constructs. This is not in line with expectations, but it is not a complete surprise since the voice-over mainly told the viewer what was already visually visible in the animation video. Also, the voice-over was mainly added to enhance trust, which previously stated, appeared having a slightly significant effect.

5.2 Practical implications

Looking at the practical implications, the results are useful as help or guidance in creating explainer videos related to IoT devices, or explainer videos of products in general. Companies that sell IoT devices and would like to enhance their perceived usefulness, trust or the general acceptance of their product, can use these guidelines to create explanatory videos for their products. It is also very useful when companies want to enhance people's self-efficacy. This can be done by creating a richly designed animation in which the product itself is visualized. These kinds of implications can lead to companies selling more products or people to experience their product in a more positive way. The results are also useful for video makers. They derive from this that a richer animation style in this subcategory, explainer videos (for IoT devices) has a positive influence on perceived usefulness, self-efficacy, attitude and perceived performance. What videomakers can also take into account from the results is the fact that voice-over itself only has an effect on the level of trust (marginally significant) and perceived usefulness in relation to the product, but not on the other previously stated factors. The primary focus is therefore mainly on the animation style, although, in combination with voice-over, there appeared to be an interaction effect. That is why a combination of both (animation and voice-over) is recommended.

5.3 Limitation & Future Research

There are several limitations in this particular study that are important to mention. Some of these limitations, therefore, lead to possible future research that can be conducted. The most important of these will be highlighted below.

In the main findings (5.1), it was explained that people develop a more positive attitude towards an IoT device because one experiences the product as more useful after seeing the richly animated video. In this video, different visual objects, ordered sections, different text sizes and fonts were used and certain areas were highlighted. A limitation of this finding is that no statements can be made about the individual importance of these specific factors. Follow-up research could focus on different conditions in which all factors are specifically manipulated, to find out whether specific or multiple of these factors play a decisive role in the enhancing of perceived usefulness, influencing peoples' attitude. As previous research mentions, stimulus characteristics and presentation factors, together with repetition, determine the amount of processing fluency that occurs (Janiszewski & Meyvis, 2001). Based on that, it could be argued to specifically manipulate the visualization of the actual product, as in this case, is done with the Google Home Mini 3D object in the video. Making a manipulation in which the actual product is displayed multiple times versus a manipulation in which the product is not visible, could lead to interesting findings related to the perception of the video.

Other results of this study direct to future research regarding trust as a mediator of attitude, since this effect was not found by manipulating the voice-over. Trust appeared to be influenced by using a voice-over, but there was no effect on attitude, which precludes any mediation. There is room for future research here, looking at possible manipulations regarding trust that do serve as mediators in relation to attitude. Besides that, the little influence of the voice-over on trust, and the fact that there was no effect on the intention and attitude, could also occur due to the fact that only one voice-over was used in the final experiment, based on the pre-test. Future research could perform a similar experiment, while taking multiple different voices into account, in order to find out if that would cause a difference in the results. Different genders could also be added to that, since it was only used in the pretest of this research. Male versus female voices could be of a significant difference, looking at the level of trust that is measured.

Looking at an even more broad perspective, it could also be argued that there are other variables, instead of voice-over and ‘design of explanation’ could be manipulated in order to find out what affects acceptance. For instance: the use of a person on camera, representing the product or its company. Alternatively to this, many companies also use a designed character as a representation of their company. Both designed characters and actual people could be included as manipulations in explanatory video’s in future research regarding IoT device acceptance.

Looking at the research sample, some limitations should be taken into account. Firstly, although gender was divided evenly in general, the gender distribution within the actual 4 conditions was slightly skewed, as can be seen in Table 1, regarding the demographics. Besides this, the research sample contained a lot of Saxion and University of Twente students, which caused that the sample is quite young and highly educated. This is not a good representation of the actual population. Future research should contain a more evenly divided sample, in order to gather more valid knowledge about the topic.

The experiment that was conducted was of a lab study, meaning that the participants were observed while performing the tasks and filling out the survey and also that the participants were aware of this fact. Being aware of this fact is also known as the Hawthorne effect, which states that being aware of this fact can influence the behaviour of the participant (McCambridge, Witton & Elbourne 2014). This often causes social desirability bias, which in this case would be changing their attitude towards the product, thinking that they 'should' have a favourable attitude towards the product. In future research, the experiment could possibly be split up into two different parts. One part would contain filling out the survey in a respondent own environment, causing as less bias as possible. The second part, the experiment, would still need observation but could be minimized as much as possible.

Another important limitation that is relevant for this study, is that the formed attitude of the respondent was fully based on one IoT device, which is the Google Home Mini. Although this product is comparable to many other smart home devices that can be controlled by speech, the product does have some differences. For example, there are different ways of addressing the device, different ways of answering and different voices (gender, tone-of-voice etc.) which could all possibly influence one’s attitude. Future research in this area could focus on the comparison between different smart speakers, in order to find out whether differences can be discovered here. Another way of future research can be to compare a smart speaker with other smart home devices that do not work with speech. For instance, how does ‘design of explanation’ make a difference in influence, in a video related to a FitBit or a smart thermostat. Both these devices are IoT devices as well, but are used for different goals and require a different way of control. It would be interesting to see if the same manipulations would cause the same effects. It could be possible that different animation styles are required for other devices, with a different focus in terms of showing the actual product, helping with how to control the device, etc. In this way, it can be discovered what the influence of voice control is in general and how a voice-controlled device is looked at compared to other IoT devices in general. This could lead to a clear view on where smart speakers stand in the whole IoT device spectrum.

The last limitation of this research focuses on the usage of IoT devices in a bigger network. What’s not been taken into account in this research, is the fact that one of the main benefits of an IoT device, which is the fact that it could be connected to a bigger network of similar devices in your house. This would bring more options to the devices, but would also make it more complex in terms of installing and making optimal use of these products. This research does not take into account that more devices could possibly lead to more complexity, making the animation videos less relevant and not complete in terms of information. If this would have been the case, respondents might have answered differently, since they have filled out the survey based on using only one device. This also gives space for future research: to what extent does complexity of the device, or the combination of multiple devices, matter? Future research could focus on connecting multiple devices and their complexity. Does the given information for 1 device remain relevant, when more devices are coming into play? And does one's attitude change, as soon as people find out how easy or hard it is to do so? This gives plenty of opportunities for future research.

5.4 Conclusion

The conclusion of this research states that an extensive animation style with additional visual elements that show the product in explainer videos (regarding IoT devices) influence the attitude evaluation regarding the targeted product. Besides this, the research showed that people develop a more positive attitude towards the visualized IoT product because their perceived usefulness was changed due to the animation in the video. They seem to perceive the product as more useful after seeing the richer animation style in the explainer video. 'Design of explanation' also appeared to cause an improved perceived and actual performance among respondents, meaning that watching a video containing an improved design causes people to perform tasks with the visualised product better, and perceive it as easier as well. Besides these findings, we also take note of the effect of animation style on self-efficacy and perceived performance and the effect of using a voice-over on the level of trust that a person perceives after watching the video.

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Appendix A - Pre Test (Voice-over)

Questions of the Pre-Test 1 (Voice/Trust)
Please give an indication on to what extent the following sentence fits the association with the voice you have just heard.

1 (Totally does not fit the voice) - 2 (does not fit the voice) - 3 (Neutral) - 4 (fits the voice) - 5 (Completely fits the voice)

Table 4: Pre-test Questionnaire

Association	Subscale	Mean	SD
Honest	Trustworthiness	3,46	,50
Trustworthy	Trustworthiness	3,65	,50
Genuine	Trustworthiness	3,53	,38
Expert	Competence	3,44	,54
Intelligent	Competence	3,45	,51
Competent	Competence	3,53	,58

Table 5: Results of the Pre-Test subscales per voice

Voice-over/Gender/Age	Link	Mean	SD
Kyra (Female, young)	https://www.youtube.com/watch?v=zt0FAFIVpvY	3,41	,61
Joost (Male, young)	https://www.youtube.com/watch?v=FrsS6MqJ3m8	3,80	,44
Donna (Female, middle)	https://www.youtube.com/watch?v=D-ACeDKJgw4	3,06	1,01
Jente (Male, middle)	https://www.youtube.com/watch?v=pO4gQD0Ejig	3,25	,86
Barbara (Female, older)	https://www.youtube.com/watch?v=aqboHgYoWAw	3,55	,74
Boet (Male, older)	https://www.youtube.com/watch?v=kLYjEWZoMYE	**4,01**	,77

Appendix B Pre-Test (animation style)

Questions of the Pre-Test 1 (Animation/Processing Fluency)
Please give an indication on to what extent the following sentence fits the association of the video you just saw.

1 (Very hard) - 2 (Hard) - 3 (Neutral) - 4 (Easy) - 5 (Very Easy)

Table 6: Pre-test Questionnaire

Question	Category	Mean	SD
How easy do you find it to visually process this animation?	Processing Fluency	4,05	,61
How easy is it for you to visualize the working of the product, without seeing the video now?	Processing Fluency	3,88	,68
How easy would you find the task, to explain what you saw, at a later moment in time?	Processing Fluency	3,88	,72
Overall, how easy are the tasks visualized?	Visual Complexity	4,19	,46
To what degree do the scenes seem well-organized to you?	Visual Complexity	4,00	,51
Interacting with the displayed product is easy for me to understand.	Ease of use	4,30	,49
The animation provides helpful guidance in performing the tasks.	Ease of use	4,13	,53
Overall, the displayed product seems easy to use to me.	Ease of use	4,20	,57

Table 7: Results of the Pre-Test subscales per animation style

Video style	Link	Mean	SD
Animation 1	https://www.youtube.com/watch?v=Drai0z1AFEM	**4,18**	,64
Animation 2	https://www.youtube.com/watch?v=niwqwSLilQ4	4,14	,65
Animation 3	https://www.youtube.com/watch?v=eNdb58uqsHE	3,90	,71

Appendix C - Script animation video

Timestam	Scene	Text (visual)	Text Voice-Over
0:00-00:15	Title: **Aan de slag Google**	**Text:** **Sluit je apparaat aan** Sluit de stroomadapter aan op je Google Home Mini. **Download de app** Download de Google Home-app vanuit Google Play of App Store op een geschikte telefoon of tablet. Volg de instructies op het scherm om de installatie te voltooien.	Aan de slag met uw Google Home Mini. Sluit de stroomadapter aan op je Google Home Mini. Download de Google Home-app vanuit de Google Play of App Store op een geschikte telefoon of tablet. Volg de instructies op het scherm om de installatie te voltooien.
0:15-00:45	Titel: **Leer je Google Home Mini kennen.**	**Tekst:** **Aan de linkerkant tikken** Volume omlaag **Aan de rechterkant tikken** Volume omhoog **Microfoonschakelaar** Verschuif de schakelaar tot de achtergrond oranje is om de microfoon uit te schakelen	Tik aan de linkerzijde om het volume omlaag te doen. Tik aan de rechterzijde om het volume omhoog te doen. Verschuif de schakelaar totdat de achtergrond oranje is, om de microfoon uit te schakelen.
00:45-1:05	Titel: **Stel een vraag met je stem.**	**Tekst:** Begin met 'Hey Google…' Gevolgd door je vraag: - …Wat is het laatste nieuws? - …Kun je een wekker zetten om 8 uur? - …Gaat het vandaag regenen? Eindig het antwoord met 'Hey Google, stop'	U bestuurt uw Google Home Mini door middel van uw stem. Zeg 'Hey Google' gevolgd door je vraag, en zeg 'Hey Google, stop' om weer opnieuw te beginnen.

	Titel: **Google Home Mini Een product van Google**		Veel plezier met uw Smart Home Device!

Appendix D - Questionnaire (English)

Geachte respondent,
Bedankt dat u de tijd heeft weten te nemen om deel te nemen aan dit master onderzoek. Het gaat om een enquête waarin u vragen gaat beantwoorden over een smart home device. De enquête is het best in te vullen via een computer of laptop, maar is ook beschikbaar op telefoon. U gaat zometeen een video bekijken, waarna u de enquête invult. Vervolgens zult u enkele taken verrichten met een smart home device, in dit geval een Google Home Mini. De deelname zal ongeveer 10 minuten van uw tijd in beslag nemen. Deelname is volledig anoniem en alle informatie die u verstrekt zal vertrouwelijk worden behandeld en zal alleen voor dit onderzoek worden gebruikt. Bij vragen of opmerkingen kunt u contact opnemen met (j.derks@student.utwente.nl).

Ikk neem deel aan deze enquête:
Ja/Nee

Voor je staat een Google Home Mini.

Dit is een Smart Home Device waarmee je jouw leven makkelijker kunt maken. Het helpt je om toegang te krijgen tot verschillende media, je persoonlijke taken te managen en het plannen van je dag. Dit alles gebeurt door middel van besturing met je stem.

Een aantal voorbeelden van wat een Google Home Mini voor je kan doen:
- Het laatste nieuws voorlezen
- Informatie geven over het weer
- Je Spotify muziek aan/uit zetten
- Je agenda bijhouden en een wekker voor je zetten
- Je thermostaat/lichten in je huis bedienen
- Informatie van Google/Wikipedia aan je voorlezen
etc.

Dit onderzoek gaat over jouw impressies van de Google Home Mini en soortgelijke producten.

Personal Questions:

- What is your age?

Wat is je leeftijd?

- What is your Gender? Male/Female
- Wat is je geslacht?

Man/Vrouw

- What is your highest level of education?

Primary school / high school / Intermediate vocational education (MBO) / Bachelor (HBO) / Master (University) / Other…
Wat is je hoogst genoten opleiding?
Basisschool / middelbare school / MBO / HBO / WO / Anders

- Do you know what a smart speaker is? (Google Home, Amazon Alexa, Apple Homepod, etc.)

Weet je wat een Smart Speaker is? (Google Home, Amazon Alexa, Apple Homepod, etc.)

- Do you have any prior experience with smart speaker?

Heb je ooit gebruik gemaakt van een smart speaker?
Yes/No

- Do you own a smart speaker device?

Heb je een smart speaker in je bezit?
Yes/No

Video

Hieronder ga je zometeen een video bekijken waarin het gebruik van een smart speaker, de Google Home Mini, wordt uitgelegd. Vervolgens worden hier verschillende vragen over gesteld. Deze vragen dien je te beantwoorden op basis van wat je in de video hebt gezien.

Let op: Je hoeft de video alleen te bekijken en nog geen handelingen uit te voeren.

Druk op afspelen, en vervolgens op het 'YouTube' icoon onderin de video, zodat er een nieuw tabblad opent. Zo kunt u de video op een later punt in de enquête nog eens terugkijken.

The participant watches either one of the four conditions.

Plain animation (with voice-over): https://www.youtube.com/watch?v=loUdkdBfbhU
Plain animation (without voice-over): https://www.youtube.com/watch?v=elEPKdcJfRU
Rich animation (with voice-over): https://www.youtube.com/watch?v=niYa44H44ko
Rich animation (without voice-over): https://www.youtube.com/watch?v=Drai0z1AFEM

Comparison video (both styles): https://www.youtube.com/watch?v=5cjMKurpyRQ

Table 8: Perceived usefulness questionnaire (Davis, 1989)

Statement	Subscale	Mean	SD
1. Using a Google Home Mini gives me greater control over things.	Perceived Usefulness	3,15	1,009
2. Using a Google Home Mini improves my performances.	Perceived Usefulness	2,91	,842
3. Using a Google Home Mini saves me time.	Perceived Usefulness	3,45	,989
4. A Google Home Mini enables me to accomplish things more quickly.	Perceived Usefulness	3,52	,926
5. A Google Home Mini supports me with accomplishing things.	Perceived Usefulness	3,54	,915
6. A Google Home Mini allows me to accomplish more things than would otherwise be possible.	Perceived Usefulness	2,98	,974
7. Using a Google Home Mini enhances my effectiveness in doing things.	Perceived Usefulness	3,05	,968
8. Using a Google Home Mini improves the quality of the things I do.	Perceived Usefulness	2,79	,856
Total Perceived Usefulness score		3,17	.641

Table 9: Trust/Self-efficacy questionnaire (Agag & El-Masry, 2016; Gefen et al., 2003; Artino & McCoach, 2008)

Statement	Subscale	Mean	SD
1. I believe that the Google Home Mini handles my received voice data confidentially.	Trust	2,78	1,106
2. I am confident in the way of operating a Google Home Mini. (voice control)	Trust	3,53	,834

3. I do not doubt the honesty of Google home Mini devices.	Trust	3,28	1,006
4. I have confidence in the operation (can help with tasks) of the Google Home Mini.	Trust	3,71	,686
5. I trust to actually use the Google Home Mini.	Trust	3,51	,859
6. I am certain that I can get along well with a Google Home Mini.	Self-Efficacy	4,03	,703
7. I am confident that I can learn the basic concepts of working with a Google Home Mini.	Self-Efficacy	4,21	,640
8. I am confident that I can understand the most complex concepts of working with a Google Home Mini.	Self-Efficacy	3,57	,879
9. Considering the explanation that I saw in the video, and my skills, I think I will be able to work with a Google Home Mini.	Self-Efficacy	4,02	,791
Total Trust & Self Efficacy score		3.62	,469

Table 10: Intention & attitude questionnaire, concepts based on TAM (Davis, 1989; Davis, 1993), items adapted from Manis & Choi (2019)

Statement	Subscale	M	SD
1. I intend to use a smart speaker, like the Google Home Mini within the foreseeable future.	Intention	3,14	1,073
2. There is a high likelihood that I will use a smart speaker, like the Google Home Mini within the foreseeable future.	Intention	2,70	1,030
3. I intend to purchase a smart speaker, like the Google Home Mini within the foreseeable future.	Intention	2,83	1,129
4. There is a high likelihood that I will purchase a smart speaker, like the Google Home Mini within the foreseeable future.	Intention	2,40	,974
5. Attitude 1 – Bad/Good	Attitude	3,62	,678
6. Attitude 2 – Negative/Positive	Attitude	3,53	,731

7. Attitude 3 – Unsatisfying/Satisfying	Attitude	3,04	,803
8. Attitude 4 – Unfavorable/Favorable	Attitude	3,13	,837
9. Attitude 5 – Unpleasant/Pleasant	Attitude	3,59	,637
Total Intention & Attitude score		3.10	,678

Nu ga je een aantal taken verrichten met de Google Home Mini die voor je ligt. Je mag bij het uitvoeren van deze taken de eerder bekeken video gebruiken, en deze pauzeren/terugspoelen waar nodig.

Lukt de taak niet na de eerste poging? Ga dan direct door naar de volgende taak.
Taak 1:
Zet het volume van de Google Home Mini op maximaal (4 stippen).
Taak 2:
Kom er achter of het vandaag gaat regenen, via de Google Home Mini.
Taak 3:
Stel een alarm in om 8:00, via de Google Home Mini.

Table 11: Questions regarding the performed tasks

Statements	M	SD
Task 1: Adjusting the volume of the Google Home Mini was easy for me to do	3,77	1,118
Task 2: Finding out if it will rain today through the Google Home Mini was easy for me to do	4,00	,974
Task 3: Setting an alarm on the Google Home Mini was easy for me to do.	4,04	,864

	Stage 1	Stage 2	Stage 3	Total points
Task 1	Using the touch button on the side of the device (1 point)	Pressing it multiple times (1 point)	Reaching max volume (1 point)	(1, 2, 3)

Task 2	Participant uses a voice command	Participant uses the right voice command	Google Home receives command: right response follows	(1, 2, 3)
Task 3	Participant uses a voice command	Participant uses the right voice command	Google Home receives command: response follows	(1, 2, 3)

Table 12: filled out by observer during task performance: how was the task performed? 1 point for reaching each stage (range 1-3)

Statement	Completed stages	% of the participants
Fulfilled Task 1 - Adjusting volume	1	13
	2	37
	3	50
Fulfilled Task 2 - Finding out if it will rain today	1	13
	2	14
	3	73
Fulfilled Task 3 - Setting an alarm at 8	1	13
	2	12
	3	75