ANTHROPOMORPHIC DESIGN AND ANTICIPATED USER EXPERIENCE

A two-step provocation design study of the user experience of smart anthropomorphic products

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Abstract

We often see anthropomorphic designs in movies as highly intelligent robots, created to make our lives easier, but anthropomorphic is far more common than that. From cameras that look like eyes to face and voice recognition technology and avatars used by companies to support their brands. Despite this, relatively little research has been made about anthropomorphism in smart everyday products, and how that affects the anticipated user experience. Two provocative studies were conducted, where the participants provided their first impressions to picture prototypes. This generated an understanding of the general opinion of anthropomorphic designs, and when added a smart daily product. These studies showed that people are open to the idea of anthropomorphic designs, but the practicality and functionality are crucial. Through identification of multiple themes and thorough analysis, this study can serve as a blueprint to aid future studies about the anticipated user experience of smart daily products with anthropomorphic elements.

Key Words: Anthropomorphic design, User Experience, Intelligent Products, Product Design, Information Communication, Uncanny Valley, Emotional Design
1. Introduction

Today we live in a world of ever more advancing information technology, where almost everyone is connected and communities are hyped around the future of technology and what the next big revolutionary thing will be (Rozendaal, 2016). We often see this in movies that robots are designed to fulfil humans needs, and that is already happening in our everyday lives as well. The reason for this is that humans are familiar with humans, which is why we tend to give machine similar human functions to let them serve us. It is also very common that some companies use avatars (such as m&m’s) to represent themselves to improve their relationship with their customers. More and more products tend to be made to look more and more like creatures (Marenko et al, 2016), for example, some cameras look like eyes with wheels. When it comes to smart products, Michael Abramovici (2014) defines them as “cyber-physical products/systems (CPS) which additionally use and integrate internet-based services in order to perform a required functionality”, designers tend to make them more intelligent by adding more human features, like voice recognition and facial recognition. These are all examples of how anthropomorphism can be applied to environment and products. Epley (2007) defined anthropomorphism in his work “On seeing human: A three-factor theory of anthropomorphism” as follows: “Anthropomorphism describes the tendency to imbue the real or imagined behaviour of nonhuman agents with human-like characteristics, motivations, intentions, or emotions”. The main idea behind anthropomorphism is that people think of other objects like humans, but by adding human features and characteristics to robots and smart objects, this creates a foundation to extend this way of thinking to non-human entities as well.

Anthropomorphism in the field of HCI is an area deserved to be focused on, because HCI focuses on design can be made from a human-centred perspective by taking the user’s preferences and abilities into consideration, all while ensuring that the user criteria are fulfilled (Benyon, 2014). Another way that this can be spotted in is how our devices today can be considered service avatar, to the extent that the device and the software at times even can take a secondary position in relation to the content that it is presenting (Kuniavsky, 2010). Regardless, a result of our new technology we have today, a lot of intelligent agents have been created that are widely used in our life. However, the principles of them are based on complex algorithms and elaborate engineering, both too advanced for normal people to understand its principles. This creates a subconscious psychological distance between the users and these intelligent products. Trope and Liberman (2010) described it like this: “As psychological distance increases, construals would become more abstract, and as the level of abstraction increases, so too would the psychological distances people envisage. Construal levels thus expand and contract one’s mental horizon”. Through anthropomorphism, however, a figurative character can be used, such as a robot or other variant of an avatar can be used to interact with each other and make people feel closer and willing to open up - since it is in a media, they feel comfortable with. In other words, a tool for closing psychological distances (Trope, Liberman, 2010). This makes it an efficient tool

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1 M&M Characters. The use of their animated characters for advertisements http://www.mms.com/us/characters
to create better relationships between users and agents to make users trust agents with high technology more. This is also a creative perspective to study the relationship between humans and products from an object centred view (Giaccardi et al, 2016). This means that the use of anthropomorphism can help us improve user experience. For example, more and more robots are starting to work in environments like people’s homes and in different care institutions, interacting with humans every day as colleagues or digital assistants Farooq et al, 2016). To ensure good long-term user experience, designers focus on the interaction ways between robots and users. It is important that robots can display their emotions, have some representations of facial expressions and body language to make it feel more humanlike and trustworthy for the humans it is interacting with. The face and the body language do not only work as a visual representation of humans, but it also gives the people around it an understanding of how it works. That way we can understand if they have understood what we’ve wanted it to do, and how they then come to interpret those instructions. This is a part of the discussion about whether robots can really “understand” things like we can, which in turn can give way for expressions of being frustration, motivation or their desires (Norman, 2004).

**The research gap and question**

During the initial research, the focus on anthropomorphism tends to be used on robots and less on the user experience of daily objects, which creates a rather substantial gap in the anthropomorphic user experience research field. From an HCI standpoint, it is important to remember that what we create, and how we interact with what we create, affects us as well.

By doing this, our hopes are that we can contribute to the filling of the research gaps by providing knowledge of how to improve the user experience, especially anticipated user experience which focuses on the first impressions, in new ways using anthropomorphic designs. There are four time spans that can be considered when analysing user experience, ranging from how we think it would be like to use it to a more long term perspective where it’s based on more user experiences and reflections over time. These different time spans of user experience are anticipated, momentary, episodic and cumulative user experience (Roto et al, 2011), these are all based on studies conducted from just the initial impressions to the user experience of long-term use. However, in this thesis, we only focused on the anticipated user experience because of time constraints. Furthermore, we focused on two aspects of anticipated user experience in particular: the appearance and the intelligent products’ interaction with its users, which we called “interactive behaviour systems”. This would also help product/UX designers to better understand how anthropomorphic features can be used in future designs whether it is purely virtual or if it is a physical artefact.
Research Question:
*How can the anticipated user experience be influenced by adding anthropomorphic design to intelligent daily products’ appearance and interactive behaviour system?*

- What is the influence of anthropomorphic design on anticipated user experience when added on daily objects’ appearance?
- What is the influence of anthropomorphic design on anticipated user experience when added on daily objects’ interactive behaviour system?

2. Related research

The related research in this paper is focused on several areas, where the main field of research is about anthropomorphism, overusing anthropomorphism will bring negative results, which is known as the uncanny valley. Since anthropomorphism is deeply connected with emotion influence, we did some research about emotion generation theory and emotional design to better understand how to combine anthropomorphism into our study. User experience is another important related research field because the emphasis in this thesis is to study the influence after combining anthropomorphism in daily objects’ appearance and interactive system. We present our literature research results below:

2.1 Anthropomorphism

Different people have different definitions of anthropomorphism and zoomorphism. Because, depending on if it is about human or animal features and elements, it can be considered as either anthropomorphism or zoomorphism respectively. In this study, we use the word anthropomorphism in a broad sense to represent living features added to digital and inanimate objects to avoid confusion or misunderstandings.

The meaning of using anthropomorphism is the core part we focus on because understanding the reason why anthropomorphism is widely used and what areas it is in use can help us define our study area. Based on this knowledge, we will know how and where to start the study. The following text below will be about three main positive areas that further motivates why using anthropomorphism: elicited agent knowledge, effectance motivation and sociality motivation (Epley et al, 2007). On the other hand, less successful applications of anthropomorphism can create unpleasant feelings, this phenomenon is the uncanny valley.

2.1.1 Elicited agent knowledge

As mentioned before, using anthropomorphism benefit reduce the distance between user and agents, especially the ones with a complex algorithm or engineering system. Elicited agent knowledge means transfer abstract complex information by using ways more easily understood by humans. In other words, a tool for closing psychological distances (Trope, Liberman, 2010). We’ve also developed advanced multinational interaction systems that the world has never seen before, but we still want to be able to convey our basic emotions, feel safe and be close to the ones we love. The ways we interact with each other, even if it is not expressed with words all the times, are based on our emotions, our bodies speak
through facial expressions, postures and other movements, just like we have for thousands of years. It is this kind of behaviour and deeply rooted interaction mechanisms that make us want to create lifelike robots and machines, to create something that we’re familiar with, that we can understand and feel safe around (Norman, 2004).

2.1.2 Effectance motivation
The location also plays an important role in how we chose to communicate with one another. If we feel insecure or if we feel like we are lost or not in control, we’re more likely to take a step back while trying to create an understanding of what is expected or required from us. This need for situational awareness and motivation is what effectance motivation entails (Epley et al, 2007). Continuing the dialogue about the benefits of anthropomorphism and modern, intelligent products now.

As more robots are being put to work in on social positions, interacting with humans daily, it is important that they can both understand human ways communication as well as making themselves understood. This can be illustrated through displays and sounds indicating emotions, or using mimicked body language. By implementing these features, a lot of more people will be able to use them, communicate and trust-based relations can be created. Furthermore, we can more easily understand if they have understood what we’ve wanted it to do, and how they then come to interpret those instructions. This is a part of the discussion about whether robots can really “understand” things like we can, which in turn can give way for expressions of being frustration, motivation or their desires (Norman, 2004).

2.1.3 Sociality motivation
This is based on the idea that the human is a social creature, which can be seen throughout all cultures across the world throughout history, we grief and express helplessness over death, care over our children and a desire to be close to the ones close to us. On these grounds of social interaction, the social situation affects us in such a way that our actions are dependent on it - in other words, we naturally allow ourselves to get close to creatures and objects if they fulfil the criteria of lifelikeness. So, with intelligent products on the rise and with a successful implementation of anthropomorphism, artificial humanlike creations can trigger this same effect if designed correctly - which has sparked the interest in creating lifelike robots and so on. Regarding anthropomorphism, Epley says that sociality motivation speeds up the development of smart agent in two distinct ways:

The first way is by applying lifelike traits since studies have shown that people who have a lack of social connections tend to have increased attention towards what could form new social relations.

The second way is based on that when a person is lonely, they are more likely to assign traits to pets or items, sometimes even anthropomorphize objects in other to achieve this sense of social interaction. This further builds on that the motivation to be social is there, just that instead of looking at cues amongst people and social environments like in way one, people are looking at the lifeless object for the same reasons (Epley, 2007).
2.1.4 Uncanny Valley

All the before mentioned aspects are related to the positive outcomes of successful use of anthropomorphism, less successful use of anthropomorphism can yield negative results, which can be described as the uncanny valley. The term “uncanny valley” is to explain people’s feeling about anthropomorphism objects and products with almost human behaviour and/or appearance - a term that was coined in 1970 by Masahiro Mori. This gap is focusing on the uneasy feeling that we feel when something is not quite right, especially when it looks human, but something still feels wrong. Situations, where the uncanny valley can occur, are ever increasing graphic designs and anthropomorphic products in circulation (Dambrot, 2011). Or as Mori puts it:

“The appearance is quite human like, but the familiarity is negative. This is the uncanny valley.” - Mori. 1970.

2.2 Emotional design

The model of emotional design is built upon a model describing how humans act, from what we do as natural instincts and how the brain controls our actions to the capabilities of reflection and contemplation. All these plays together, resulting in the actions humans do whether they are good or bad (Ortony et al, 2005). Even though this theory is good and important it does not quite serve as well in this purpose. Since the emotions are a major part of how we act and perceive designs, it is important to keep that in mind as well (Preece, 2015). The theoretical framework that suited the purpose of this study the best is the emotion generation theory about emotional design, developed by Norman (2004) as a variation of Ortony’s (2005) work.

With the use of emotion generation theory, which combines three areas of emotional design, a deeper understanding could be generated about each of the factors of emotional design that were used for this study. Whenever we are experiencing something, it happens on several levels, and if the product’s design is important, it also affects us on those levels. The three levels used in this study are the following:

1. Visceral (with focus on visual): Where the focus lies on the first impression. The design, materials, and our initial thoughts are the area of concern here. The reason why the focus came to be on the visual is that almost all of this is about the looks, meaning it is the main component in this stage, and that there would not make that much of a difference if the rest was included or not.

2. Behavioural level: Focuses on the user experience of the product, more specifically how it works in relation to its intended use, how it feels to use and how usable it is. This means that the quality and design are important since they are directly connected to its functionality - in other words, confusion, satisfaction and frustration are some of the keywords in the evaluation process of this level.

3. Reflective level: The highest and the most culturally dependent of the levels, this is where the user’s emotions and feelings are put in the centre, especially considering that if this level portrays bad impressions of a product or design, it can overwrite the
other previously good impressions. This is much more connected to a person’s rational and intellectual thinking; one could even say one’s compassion and compassion.

With the use of these factors, the appearance, effectiveness and the user satisfaction, in mind, a more thorough design process can be created - rendering more insightful feedback from the interviews, from both the pilot as well as the main study. It should be clarified that because everyone has different backgrounds, values and experiences, one cannot use this to generate something that will please everyone. It can, however, be used to take cultural differences or previous experiences into consideration to increase the perceived user experience for the better.

2.3 User experience
There are three main perspectives that can be used to define the user experience. Hassenzahl is mentioning in his paper that they are beyond the instrumental, emotion and effect as well as the experimental. Even though he is clear that it does not necessarily capture the meaning of UX, it is still a good visualisation tool that can be used to grasp this rather vast topic (Hassenzahl. Tractinsky, 2006).

This model (Fig.1) indicates, that UX is the results of the user’s point of view, how the product is designed and the context of where it is used. The paper “User Experience White Paper” (Roto et al, 2011) further elaborates on this, where factors that influence a person’s user experience are divided into three categories:

1. The context about the user and the system, this includes different kinds of contexts from physical and social to information and technologically based contexts. This means that the context can be anywhere at any time, it just needs to be defined in the design process to optimise its intended use.

2. The user’s perspective is focused around a person’s situation, motivation and expectations connected to using a product. This can be a make or break in aspect since it is directly tied to the user’s own impressions and values.

3. The system highlights the features and design of the product of system in question, this is both connected initial settings but also how it potentially changes over time as the user are changing its nature with its input. Because of this, the branding, functionality and including fail-safes are important (Roto et al. 2011).

A lot of research has been made on this topic; the curiosity of the people has increased which has resulted in an ever more increasingly shifting in the user base. Following this and the new age of HCI that we are in now, the demands have risen, the technology has
been more user serving and a new view of psychological well-being has been established because of this. It is not necessarily that the problems will be gone and then it will be all good, it is rather that instead of solving everything the users have going on in their lives, it is focusing on making their everyday life and experience more enjoyable (Hassenzahl, Tractinsky, 2006).

Furthermore, there are different time spans that user experience can be investigated on, all depending on if it is initial usage or long-term use, ranging from anticipated user experience to cumulative user experience, as illustrated in the model above (Fig. 2). The main difference between these two extremes are that anticipated more plays on the user’s emotional responses whereas cumulative user experience takes into the long-term experience, giving a clearer picture of the user’s opinions of the system based on experience.

All of the knowledge gathered about anthropomorphism, emotional design and user experience above have generated more ideas about what methods to use when conducting this study to answer the research question: How can the user experience be influenced by adding anthropomorphic design to intelligent daily products’ appearance and interactive behaviour system?

3. Study 1 - Pilot study

The first step was to study the influence of anthropomorphic design on user experience when added on daily objects’ appearance. Since anthropomorphism is a broad and complex topic, it has lots of ways to combine this design concept with intelligent products. The most direct and simple way to start the study was chosen, by directly adding human elements with different processing ways on randomly selected everyday objects with Adobe Photoshop to create out picture prototypes. These pictures were designed as interview material to let the participants understand the concepts directly rather than only asking about their opinions about anthropomorphism. Furthermore, interviews were conducted with the participants because their feedback is important, which makes it easier to gather people’s first impressions of anthropomorphism used on products’ appearance.
3.1 Method
The data gathering method used in the pilot study focused on gathering qualitative data on the participants’ anticipated user experience (Roto et al. 2011) of the pictures of design concepts presented to them. This qualitative data was based on the participants initial impressions, thoughts and opinions of the presented concepts. The study was conducted through a combination of semi structured interviews and provocational design study methodology (Bardzell, et al 2012; Raptis et al, 2017). By using semi structured interviews while presenting the pictures of the design concepts, a better understanding on how people think of the uncanny valley (Dambrot, 2011) could be generated, which was important to know when designing the main study in order to be able to ensure the most accurate results.

3.1.1 Participants
In this pilot study, a total of 15 participants (7 female, 8 male) between the ages of 24-28 were selected. Due to time constraints, participants were selected through convenience sampling, by asking students around campus if they would be interested in taking part of this study, or if they knew someone that would be and snowball from there.

3.1.2 Materials
When designing the prototype pictures, several randomly selected everyday objects were selected, based on use frequency and how familiar people are with the products. From here, we could focus on aesthetic changes to single out the impact of added visual anthropomorphic elements. These products then became the foundation of the concept designs that this study would be based on. By using Adobe Photoshop, human elements were added to these products - these were all on different human levels, going from facial features to larger body parts, the elements were: nose, ears, face and limbs. Because the human body consists of so many parts and can be divided into plenty of different groups such as facial elements, hands and finger and limbs and body, this was the most natural way forward. When creating these concept ideas, we combined the product design method - CMF (colour, material, finish) into our design, which means we chose different elements processing way to process elements (such as the cartoon presented below that is abstractive on different levels) (Becerra, 2016). Provocative design theory was utilized, the kind of design with the goal to take designs and concepts to the next level using hypothetical designs, among others, to challenge the views and assumptions that people have today - hence the term: “provocative” (Bardzell, et al 2012; Raptis et al, 2017). And naturally, the uncanny valley was kept in mind throughout this stage (Dambrot, 2011) along with the triangulation (Rothbauer, 2008) analysis method to make way for good analysis (Salkind, 2010).

Through the focus on anthropomorphic implementations on different levels, a more wholesome understanding could be created, ultimately generating the following anthropomorphic design concepts:

Lamp with a nose, levels of abstractness
A human-looking nose was attached to a lamp, this nose was made to be more and more abstract, thereby less identifiable as a nose. This was done to investigate whether the level of abstractness is something that affects the user experience in anthropomorphic designs.

Cup with ear: Human features or animal cartoons

In this case, some changes were made to a cup using different versions of ears, one of these were a lot more reminiscent of a normal handle whereas the other one was a lot more human-like ear. Since this was a part of the pilot study, two cups were designed, where a human ear and a cartoon handle were used to illustrate the extremes between them to see what the general opinion was.

Teapot with Beijing Opera face: “Face the heat” - multifunctional practicality

Based on a teapot, but with the addition of the “Beijing opera face”, which is related to Chinese opera culture, where the masks are used to express emotions and status. Furthermore, they are connected to a person’s personality, importance and most importantly temper. A more aggressive character can be illustrated with a red face and a blue face can illustrate a calmer character. By assigning characteristics to temperatures, they would instead carry the message if the temperature is too hot, too cold or if it is perfect to drink.

Dancing speaker and waving coffee machine: Addition of limbs

A speaker with added legs or an arm on a coffee machine - it affects how we perceive them, but they add no real function at the beginning. A second pair was created with different colour and proposed material to investigate the importance of that aspect in user experience.
3.1.3 Procedure
This series of interviews were conducted over a week. Each interview lasted for approximately 10-20 minutes. The focus was their first impressions, with the underlying theory of design provocation. The interviews took place around campus, where the participants were shown pictures of these concepts to get their feedback, thoughts and first impressions. The interviews took place around campus, where the participants were shown pictures of these concepts to get their feedback, thoughts and first impressions. The sessions were audio recorded and later transcribed into words for further analysis. The data were analysed through transcription of the interviews of what they said combined with paying attention to how they expressed themselves.

The interviews were semi-structured and here are the questions that were asked for each prototype picture:

- How do you feel about this?
- First impression?
- Thoughts?
- What do you like/dislike about it?
- Can you understand why we design like this?
- Would you consider buying this and put in your home?
- At the end of the interview: Any other comments?

3.2 Results
From these interviews, we gathered some interesting results that were quite insightful and helpful for us moving forward. Some of the responses we got regarding some of the products came to shed some more light on the initial uncertainties that existed going into this pilot research stage.

In the first prototype, the lamps with varying abstract noses, some interesting feedback was received when the participants were shown the first and the most anthropomorphic version of the lamp; “oh, a lamp with a nose, can the lamp change its colour or brightness if you give it different smells?” (p1.1), “Does it mean you need to use your nose to turn on or turn off this lamp?” (p1.3). When they found out that the nose didn’t have any functions, they felt that the only difference was that it is more interesting/attractive than just a blank lampshade and a strange decoration. As more abstract designs of the nose were presented, as it started to get more merged with the lamp as an abstract decoration, the number of people asking what the reason for this study was decreased.
In the second prototype, the cups with different ears, the participants saw that handle of one cup was replaced with a human looking ear, saying that must feel creepy to touch that. “I am curious about how it feels to touch that ear, but it would feel so weird to do that.” (p2.4). When the ear was made to look more like a cartoon animal ear, almost no one felt uncomfortable of the ear anymore, some even thought it was cute.

The third prototype, the multifunctional teapot, was the most popular product in the pilot study; “It is really clever to combine Beijing Opera Face with a teapot, and especially the face can show the temperature as well.”(p3.7). Some of the participants (especially the Chinese participants) even stated that if they could they would like to buy this product already, because of its functionality and cultural significance.

The last two prototypes, with the addition of human limbs, commonly asked two questions when presented to the designs; “Why you design like this” and “Do they have any real function?” When told that they do not provide any additional function, more negative feedback was expressed like; “I think it is a little creepy.”(p4.10), “I think it is a strange combination of putting limbs on these everyday products.”(p4.8), “Is there a woman who hides inside the speaker and a guy hides behind this coffee machine? Because it feels the legs and arms don’t belong to these two products.” (P4.6).

After concluding the pilot study, it was clear that the pilot study has provided some valuable points and knowledge that in turn gave in increased understanding of the how people feel about certain anthropomorphic design methods and solutions going forward:

1. Belonging is the most important influence when doing anthropomorphic design. If human elements were directly added human elements as they are without making any processing to create a sense of belonging, people will feel that is unbalanced and redundant. Just like the case of the coffee machine and the speaker, directly adding human limbs can make people uneasy because it does not look and feel like they belong together.

2. An efficient way of decreasing people’s unpleasant feeling is by using some processing ways, like making elements more abstract or more like a cartoon. This is a useful way to make the products and all the elements look like they belong together as a whole.

3. People tend to find meanings for additionally added elements. While conducting the interviews, the most common questions the participants asked were along the lines of “what is this for?” People try to find a meaning of the addition of human elements before regarding them as decorations. Because of this, the teapot became the most popular design as the Beijing Opera face on it is not just a decoration, serves as an example of a good combination of function (show temperature), culture and decoration.

4. Study 2 - Main study

Based on participatory feedback from the pilot study, anthropomorphic elements on products can attract users, but the study showed that the use and implementation of these elements are vital for it to work or not. If anthropomorphic elements were put on products
It can create the opposite effect, making the intended user feel uneasy because the elements just do not fit together with the product.

This shows that for design processes of this kind, the whole product needs to be taken into consideration instead of just adding elements without any functions and visual appeal. Following the first study, the second study will focus on intelligent products to see how the interactive user experience can be influenced by using anthropomorphic elements. How can a good combination of product functionality and anthropomorphic features be achieved, and how can it be used to create increased user understanding?

By separating the different elements and technical features, this form could be paired up with function, creating an opportunity to create working links between these otherwise foreign elements that could increase the user experience.

4.1 Method

This study used a mixed data gathering combined both quantitative and qualitative methods, by combining surveys with interviews. The survey was a combination of our prototype pictures and variables we want to study. Conducting interviews helped with understanding the reason behind the participants’ choices and get their whole reflective perspectives of smart products with anthropomorphic designs.

4.1.1 Participants

In this pilot study, a total of 11 participants (6 female, 5 male) between the ages of 21-60 were selected. The participants were selected by asking around among students on campus if they would be interested in taking part of our study after giving them the details of what it was about, and through snowballing, other people from outside of campus could be invited to take part in this study to increase the variation in participants.

4.1.2 Study object

The focus of this study was centred around a smart coffee machine with anthropomorphic features. When deciding on what products that will be picked, its’ use frequency came to play an important role, mainly because there would be more gain and interest in studying products that are used regularly than products that no one uses. Because of this, the study object became the coffee machine, a familiar product which is used regularly that everyone knows about.

The thought process about what features the coffee machine would have and what they will look like had to be made. As inspiration, one can have a look at what other smart products have in order prevent the risk of overlooking some elements that could be beneficial to have in the coffee machine had, or at the very least were taken into consideration during the development. Components like what it is made of, how the hardware and software are integrated, how it communicates, and how it is used etc. are just a couple of examples from the list of things that can be analysed in a smart product analysis (Abramovici, 2015). However, there are some key components that came to be the variables
that we came to focus on, namely, the appearance, sound, display, sound, texts in advertisements.

### 4.1.3 Prototype factors

Since the focus of this study is on how the user experience gets affected after combining anthropomorphic design on intelligent products. We divided our variables into three aspects by combing the emotional design theory (Norman, 2004): visual, behavioural and reflective.

The visual part was studied by combining anthropomorphic design on both the outline as well as the additive elements of products. The products, in this case, were represented by two pictures of coffee machines on the market at the time when this study took place, one with the shape of a cube/block and one with what can be described as having a round snowman-like head and body. By adding ears and tails on both of them, we created four options for the participants, the two current untampered designs and the two new more anthropomorphic designs that the participants could choose from.

When it comes to the behaviour part, the word “behaviour” has lots of definitions, in this case, however, the focus is mainly about information communication between users and products. This approach on behaviour and the selected methodology of the study allowed the relationship between a product’s function, how information was distributed and how people perceive this information to be shown.

Let us look at the like the previous pilot tests for some inspiration. When the coffee is ready, people can hear the sound from a coffee machine to know that it is ready to drink. But what if this was combined this with a human-like arm to wave to people, almost creating the illusion of the machine saying: “Hey, your coffee is ready, over here” - one could even include that as a voice. These two elements, an arm and a sound/voice are both ways to express information, which changes the relationship between people and the coffee machine. To do this, three variables related to behaviour were chosen:

1. The notification sound when the coffee machine turns on/off and when the coffee is ready. By providing three options to the participants: automatic machine sound (Beep), human voice (“Hello/Goodbye” “Your coffee is ready!”), no sound.
2. We focus on the start animation of the display and give two main paths - eyes and coffee beans. Each path was given three different levels of detailed illustrations, from more abstract to more detailed, where the participants got to choose which one of the six provided options they liked the most.
3. Anthropomorphic text in advertisements was studied. Two advertisements were created using two different ways: one where the avatar/product presented itself: "Hiya, I am Coffy and I am here to make your day a better, by making you lots of joyful cups of coffee to take your mind off your responsibilities and to serve your guests at home". The other was created to be presented by the company: “This is our new, improved coffee machine created to make your day better with great coffee at home or at work”. The answers and reflections that the participants gave generated half of the data that would then be used in the end analysis to draw conclusions.
The last part is about the reflection, which is like the reflection like the overall feeling a person can get, means that the reflection essentially is a conclusion of the impressions a person has - making it great for product design evaluation. To further gather the reflections from the participants, questions using Likert scales were used. This way, they could grade their opinions and standpoints on how important it is that the coffee machine is smart, how much they think that the addition of human/animal elements on products can increase the experience and how important it is for them that the coffee machine has app compatibility. We also did a deep interview with our participants, asking the reason for their choices and ask their overall feeling of this survey.

4.1.4 Materials
The material for this one study is in the survey that was conducted using a number of questions. Two pictures of coffee machine that could be found on the market at the time this study took place were selected with two different designs, these two pictures came to be the foundation of the two concept designs that were created. One of these machines had a more square-like shape and one with a more dynamic shape. It was important that they were similar in size, colour and material in order to keep as many variables as possible the same. Using Adobe Illustrator, they were given zoomorphic traits of a cat and dog respectively a set of ears and a tail (Question 1). Multiple sound concepts were created ranging from silent mode and a computerized beep to having a voice talk to the user about what is going on (Question 2 and 4). Two different start animation concepts were created, one consisting of eyes and the other of coffee beans, both with three options in how abstract/detailed they were (Question 3). A design proposal to a formal and informal/anthropomorphic advertisement was created, displaying anthropomorphism in a different way through text (Question 5). All of these were then compiled in a new case-oriented survey combined, Likert scale rating questions and deeper interview questions (Question 6 and deep interview questions).

The results from the previous study and related research were used combined with the idea of using triangulation (Rothbauer, 2008). Through the focus on anthropomorphic implementations on different levels, this time based on the user creating what they wanted themselves, the means to gather the knowledge to get a deep understanding of what people are looking for were created.

4.1.5 Procedure
This series of surveys and interviews were conducted over two weeks’ time. Each session lasted for approximately 30-40 minutes. The sessions happened in group rooms where the participants filled in the survey and connected to that, a deep interview about their answers were held in order to understand their reasoning what people were looking for. The sessions were audio recorded and later transcribed into words for further analysis.
4.1.6 Analysis method

This chapter consists of the way of analysing the data gathered along with compiled results from the main study in order to identify common factors or outliers in order to generate a wholesome and factually accurate discussion and conclusion.

When analysing the results from the studies, a lot of inspiration was taken from the thematic analysis model (Mortensen, 2019) along with traits from the triangulation (Rothbauer, 2008) model to narrow down on the conclusions. By doing this, it will be easier to generate the insights required to conduct the analysis, end discussion and conclusion making. It’s also important to be aware of phenomenon such as confirmation bias (Plous, 1993) and the Hawthorne effect (Landsberger, 1958) to ensure accuracy and impartial conclusion making. This way we make sure that we do not just look for information that serves our cause, and that keeps us aware that the participants might act or make decisions differently compared to how they normally would.

The thematic analysis method is a process that is used to identify trends and patterns in user/participant generated data, in order to easier make a more in-depth analysis. This method is built upon honesty and respect of the data gathered while going through six well-defined steps in order to achieve the goal of structured data and a clear understanding.

1. Data familiarisation, meaning that in order to be able to start the analysis, the data must be gathered and reflected upon by reading, or through participant data transcription.
2. Theme division makes it is easier to work with the data regarding a certain topic without missing important aspects that could prove crucial for the end discussion.
3. Use this new structure to look for patterns in the gathered data.
4. Review the themes to validify their relevance to the topic of the paper.
5. Establish the names of the themes as well as what they mean and include, typically through chapters or paragraph divisions.
6. Compile it into the final product which is the complete paper.

Furthermore, with an awareness of the confirmation bias, the end analysis was given increased chances to remain truthful. By lifting points from both perspectives while at the same time ensuring that the outliers don’t get disproportionally much attention.

For the end discussion, the Hawthorne effect can also be important to take into consideration, as that could be one factor that did subconscious tweaks in the participatory responses. By combining these ways of analysing the end results, while taking the pros and cons of within-subject designs and the use of mixed method into consideration - more nuanced conclusions can be made that can prove useful to future studies in the same or similar fields.

4.2 Results and analysis

After the surveys, lo-fi paper prototypes of the products made through the choices of the participants were created along with a little information about the participants themselves as well as the advertisement of their choice. This functioned as an illustration for the
participants to see what they have created and to create visual representations to make the analysis easier. When analysing, it is important that the dialogue is as close as possible to the truth as possible, that no side is being focused more than the other by lifting both strengths and weaknesses of each side. By doing this, the results can show what effect the combination of anthropomorphic/zoomorphic elements on people’s perception of smart and everyday products. This was done by identifying themes from the answers provided in the surveys and in the interviews, by doing this, it got easier to analyse and create a deeper understanding of the common trends that were revealed in these studies.

4.2.1 Results - Survey Questions 1-5

The results of the first five questions are presented below, these results were also compiled as paper mock-ups to give the user a visual illustration as well as serve us as a visual representation tool for the upcoming analysis. These pictures can be found in the appendix because some of the advertisement texts became too difficult to read. The table below presents the results from 1-4:

<table>
<thead>
<tr>
<th>Product</th>
<th>Animation</th>
<th>Beep</th>
<th>Voice</th>
<th>None</th>
<th>Beep</th>
<th>Voice</th>
<th>None</th>
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</thead>
<tbody>
<tr>
<td>A</td>
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This table shows a clear preference towards beeps and prototype D, whereas the opinions about whether the start animation should focus on eyes or coffee beans had a rate of 7 to 4.

In question 5 however, comparing the preferences of anthropomorphic and informational advertisement texts, the opinion was a lot more evenly divided. The participants favoured
the informational, non-anthropomorphic text, to a rate of 6 to 5, indicating on a much more even split compared to the other results.

4.2.2 Results - Survey Question 6: The Likert scales

After the first five questions were answered, the participants were presented with scales where they had to determine, on a scale from 0-5 if they agreed or disagreed with the statements presented or if they found presented aspects important or not. The questions/statements were as follows:

- **How important is it that the coffee machine is smart?**
- **I feel like the addition of human/animal elements on products increases the experience**
- **App compatibility/remote possibility to the coffee machine is important to me/is something I want.**

The results from these questions are presented below:

<table>
<thead>
<tr>
<th>Q</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Smart</strong></td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>Not Important/Important</td>
</tr>
<tr>
<td><strong>Anth</strong></td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Disagree/Agree</td>
</tr>
<tr>
<td><strong>App</strong></td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>Disagree/Agree</td>
</tr>
</tbody>
</table>

These results show the following:

- It isn’t that important if a coffee machine is smart or not, although some voices were raised saying that it could make it more attractive for them.
- The addition of anthropomorphic elements did not increase the user experience to the users, although it could make it more attractive according to some.
- People were in general not that concerned about if the coffee machine is app compatible, but some were saying that it could make things easier.

4.2.3 Analysis - Survey Questions 1-5

When analysing the survey questions, we also included what the participants said in the interviews when identifying the themes. Since the interview questions were focused around the answers the participants provided in the survey, it provided a lot more details of how they were reasoning, making it easier to identify the themes. The feedback and insights from the participants survey answers and interviews were separated into different themes as conclusions about the anthropomorphic application on visual and behaviour. Furthermore, each theme were separated into pro anthropomorphism and pro functionality.
Theme 1: Appearance
This theme includes the product’s function and shape, what people use it for and what they like in terms of features as well as the shape and the exterior design.

Pro Anthropo-/Zoomorphism
The design and overall look of the machine are cute, and it can be used to make the product feel more appealing and attractive to some users. Notably, the people interested in the anthropomorphic designs either had a desire of getting something new or had an interest in design, to begin with. This can be linked to the creativity of product creation as well as making friends of otherwise inanimate objects. One voice raised implied that even if it wasn’t technically a good thing in their eyes, it could still serve as an introductory toy for younger audiences.

Pro Functionality/Minimalism
The coffee is the important factor, rendering the functionality and simplicity a top priority. Points of objections to the proposed anthropomorphic designs were all related to one of three areas: simplicity, physical space or maintenance. Common opinions were that space is important in a small apartment/home, that elements that aren’t necessary for the job are unnecessary and that it should just be kept simple and minimalistic.

Theme 2: Voice
This theme is about the notifications/sounds that come from the machine, whether it is notifying that it is finished, that it is turning on etc.

Pro Anthropo-/Zoomorphism
Voices serve as better reminders, since it is much more distinct/identifiable than other more standardized notification sounds, meaning that the people are less likely to miss the notification. Some voices were raised regarding the interest of having the volume of the voice turned down as a “Hello” when starting and then keep beeps, whereas others were experimenting with the ideas of having dynamic meows instead - indicating zoomorphic preferences over anthropomorphic ones. Some people proposed that the voice line could be shorter to avoid confusion and annoyance, one way to do this could be by replacing “your coffee is ready” with “finished”.

Pro Functionality/Minimalism
Having a voice say “your coffee is ready” can make people feel bored or even annoyed about the voices the machine gives - especially in the context of a staffroom, forcing you to talk louder to not get distracted or to be able to ignore how annoying it can get. Because of this, beeps are preferred, they are short, non-distracting and can be put on a low volume. Some people talked about the unpleasant feeling of hearing too human-like voices like that, indicating tendencies of the uncanny valley in action.
**Theme 3: Screen**
This theme focuses on the features added on the display in terms of a start-up animation in this study to create a sense of a friend waking up to make the user some coffee.

**Pro Anthropo-/Zoomorphism**
People generally think this is a cute addition that doesn’t take up any more space than necessary. Those who picked the anthropomorphic designs picked the eyes because they thought it fits with the product’s overall aesthetic of the product without interrupting the experience. A dynamic animation can bring more interactivity.

**Pro Functionality/Minimalism**
There weren’t no real comments about the screen other than “what’s the use of something like this on there?” and “just let me know the screen works”. Other than that, the desires of keeping it minimalistic came up, where one even proposed the use of quiet buttons instead of an interactive screen.

**Theme 4: Text used in Business/Advert style analysis**
This theme was created to highlight the different characteristics of a text, how it makes people feel and what they would prefer if they were to buy the product for themselves.

**Pro Anthropo-/Zoomorphism**
The use of a more friendly and introductory text created a feeling that to some are much more appealing/attractive than the other one. The impression this text gave was that this product was there to serve the user, which put the user in a more dominant/important role.

**Pro Functionality/Minimalism**
Plenty of comments about the functionality, legitimacy and the importance of the band were raised. By talking from a commercial/brand standpoint to the customer, all the necessary information was given, the reputation of the brand was kept, and it was made in a way that created the illusion of authority and with the customer in a lower position - indicating a trust dynamic.

**4.2.4 Analysis - Survey Question 6: The Likert scales**
These themes are based on the user feedback from participants’ options throughout survey questions 6. This feedback was separated into different themes as conclusions about people’s overall perspective about anthropomorphic design on smart products.

**People’s view/perspective with objects:**
The general opinion among the participants in these studies is that people generally regard products, whether they are intelligent or not, as items and not as living beings or something that they have a close relation to. When asked about which products they felt like they had a closer relation to, the answers were usually related to products that they have been using frequently and/or for a long time, such as their computers and phones. This kind usage
does not only generate experience and increased familiarity with the product, but it also creates memories by being a part of everyday whenever things happen - and stories increase the sentimental value for the product. However, people have different views of different products, people’s special feelings towards electronic products are lower compared to their crafted counterparts. This puts smart items in an interesting position since, as established earlier, they are a mix of both physical and digital.

**Smart or not smart:**
When asked whether they would like to have an intelligent coffee machine or not, they asked what it is that gave their machine smart. Coincidentally, in the context of a coffee machine, that definition seemed to differ quite substantially. To create a common ground for the purpose of the study, it was defined as multiple and well elaborated pre-sets to choose from, customizability as well as the potential for inter-device communication if the user would desire that.

However, not everyone was interested in a smart product if this kind because of previous experiences or needs of a working coffee machine. When speaking of interests, a difference can be spotted between most of the participants in this study and the standpoint of the designers. The people creating the machines/products have an interest in creating attractive and functional machines that fulfil all of the user’s coffee related desires whereas a large number of the people questioned in this study just wanted it to work, be simple to use and produce coffee without much hustle.

**APP:**
Today, the main features of the apps that are connected to intelligent products can be divided into two main features: Record and Control. In the context of the coffee machines, it could take form like this:

1. **Record.** By monitoring the use of the machine, the average consumption and with the added possibility of keeping a healthy diet/intake, it creates a profile of the user’s coffee consumption. Some people, however, can feel like it is invading one's private space, especially if used in the staffroom or other public spaces. Others just don’t want seemingly mundane activities of their lives like coffee consumption to be monitored their life to be monitored. But overall, the people just don’t expect a lot from the record function in general, thinking it is useless.

2. **Control.** By providing more and simplified options of control to the users, they seem to be accepting and welcoming of that change. However, the kind of control that is desired is a matter of individual preference, which the results from the study shows; some participants completely rejected the idea of app control usage where others think it would be a lot better.

**5. Discussion**

In this chapter, the results of the gathered data throughout the paper are discussed along with the strengths and weaknesses of the methods that were used are highlighted.
Furthermore, how the research gaps were filled by answering the set research questions and what improvements can be done in future studies are also highlighted below.

5.1 Results in relation to the research question

In this study, the goal was to answer how the anticipated user experience can be influenced by adding anthropomorphic designs to intelligent daily product’s appearances and interactive behaviour systems. To answer this, two studies have been conducted, one pilot study that focused on the appearance specifically and one main study which focused on anthropomorphic preference of a daily product they were all familiar with, both of which generated valuable insights.

The pilot study was heavily related to the visual designs, using somewhat extreme contrasts between normal products and anthropomorphic elements, using everything from facial features to limbs from the body. With inspiration to do this rooted in a series of industrial design experiments using anthropomorphism, by Creama Wong (2017), that focused on words, pictures and realistic body parts in relation to functionality. The results showed that anthropomorphic designs using body parts connected to daily activities got more attention compared to normal products, despite not making the activity any easier. That this attention can be both good or bad (ibid.), and that context and self-awareness play an important role in how we act and perceive a product (Roto et al, 2006). In our study, the participants who preferred the anthropomorphic alternative were generally the participants where the interviews were longer due to curiosity and interest, whereas the ones who went for a minimalistic design were more direct in their answers. However, it always came down to two factors, appearance and functionality: what did these anthropomorphic features do, how could this be more elaborate or how inconvenient would it be in terms of space. Just like in her studies, the focus tended to lean to the element itself and not necessarily towards the intended use of the product (Wong, 2017). This helped us come to the answer of the first sub question, whether the appearance influences the anticipated user experience, which was based on the participants’ first reactions (Roto et al, 2006). Some of the participants even said that they felt uneasy with some of these designs, indicating that the uncanny valley was in play here. These answers alone made us realise that the uncanny valley can still be an important thing to consider when it is taken out of its normal context and is not only applicable to a human looking robot or animation (Dambrot, 2007; Mori et al, 2012).

From there, we could move on to study two where the focus was anthropomorphic elements were added in physical parts, voice and in text. For this, two studies were used for inspiration combined with related research were used to get the results we needed. The first one of these studies is Puzakova and Rocereto’s (2013) study, that focuses on anthropomorphism in relation to brand reputation, and how that affects the user’s thoughts of a product. This created insights in how text can be used and the importance of reputation in relation to user experience in terms of functionality, visuals and text. They highlight product characterization, and how that influences our opinion of a product, the results were that the character (at times equivalent to reputation) certainly affects the overall impression of a product (Puzakova et al, 2013). Just like in our study, it was clear that the
characterisation by itself was not enough reason to dismiss a product, people were instead keen to draw parallels to practical use case scenarios. Compared to their study, we did not provide any reputational input before or after the participants got the chance to evaluate the products themselves. The difference in our results was that the participants tended to ask us some more questions instead and ultimately their own perspective and reasoning took over. However, it would have been interesting to see if the results became different if we switched method with each other, just to highlight the impact reputation and reviews can have.

The second of the two studies was Touré-Tillery and Mcgill’s (2015) study, which focused on trust in messengers and preferences in the information provided. The main difference between theirs and our study was that we conducted a preference test based on that they could see both design ways. They highlighted that more people specifically expressed that they liked the anthropomorphic advertisement method compared to the other one. However, in their conclusion, they established that the approval rating of both advertisement styles was almost the same, which by itself we thought was rather unclear since we had to investigate the details before being able to fully understand their results. The reason why Touré-Tillery and Mcgill’s (2015) highlighted this could be related to that they felt it was something different, whereas participants in the other camp it felt like a normal advertisement, but that the approval was similar. We think that the experiment about anthropomorphic texts in advertisements could be made as a within-subject study (compared to their between-subject study). That would allow the participants to see all the options for more extensive readings, which could be added as an additional step where their experiment ended. Comparing the results, our results show a preference of 54.5% to 45.5% to the non-anthropomorphic version, further showing that our results were very similar in terms of similar approval ratings. Not only would that be a way to true to the data that they gathered, it would also allow a more inclusive end discussion (Mortensen, 2019).

By putting our own study in relation to previously made studies, with the use provocative design studies (Bardzell, et al 2012; Raptis et al, 2017), thematic analysis (Mortensen, 2019) and triangulation (Rothbauer, 2008) a good analysis could be conducted. Because of this, we were able to prove that our results were not that different in many cases despite different methods used. But most importantly, these reflections have generated insights into what we think that we, along with the people conducting the related research, could improve on for future research, being changes in methods, clearly structured results or improved prototypes used. By focusing on anticipated user experience, we could focus on a very specific part of user experience, for this we used what is presented in the “User experience white paper” (Roto et al, 2011), which was particularly useful when it came to deciding what kind of user experience it was we wanted to focus on, and since time constraints was an issue for us, anticipated user experience was the most suiting one to go for in our case. Another interesting discussion point that occurred was regarding the context of body parts and the uncanny valley in relation to body parts taken out of its original context. We already knew that the context where these designs appear matters how we perceive them before conducting our studies because of related research, but multiple of the discussants, along with some from the thesis defence session, were
talking about how it felt weird to see these parts disconnected from the body. Which by itself proves that context matters, but that it can also be applied to individual parts and not the anthropomorphic smart system (Dambrot, 2007; Mori et al, 2012). Using all these insights about anthropomorphism, the uncanny valley and the other areas discussed the discussion so far, have helped us get the insights needed to be able to answer the research question of this study.

First, the data gathering methods along with the quality of the data were investigated by focusing on its strengths and weaknesses.

### 5.2 Interpretation of data and strengths/weaknesses

Next, the data gathering methods along with the quality of the data in this chapter are investigated by focusing on their strengths and weaknesses.

#### Strengths

1. **Multimethod study.**
   This research in this paper consisted of two main studies that had different methods, to highlight different things and ensure quality results:
   - The Pilot study used pictures and interviews, combined with a provocative study methodology, in order to gather as much from the participants’ initial responses as possible despite the time constraints.
   - The main study used a mixed method, combining surveys and interviews, which gathered both qualitative and quantitative data. This way, a lot more data could be taken from a smaller participant pool due to time constraints.

   This combination of methods was used because of this study’s topic since it was built on a combination of theory and participant impressions, we found that this was the most effective way to gather the data needed to answer the research question.

2. **Result analysis from two perspectives.**
   By taking both the anthropomorphic and the minimalistic perspective into consideration, we could stay true to the results and provide a detailed picture of what the results were from two perspectives. By doing this, we can help future researchers know how to use anthropomorphism to improve the user experience in smart products, but also know how to avoid the negative results.

3. **A broad focus on anthropomorphism**
   With the use of anthropomorphism in a broad sense, we could focus on both the appearance and behaviour side of things. This allowed us to highlight the ways of information communication, the use of displays and sounds along with text in advertisements. Since there is less research about anthropomorphism used on daily objects, we think it is important to give a blueprint of how to do it in this area in order to help other researchers go deeper into each of the themes we have presented or any other area they’d like. The important part is to let them know much future research potential this area has.
Weaknesses

1. Use of simple prototypes.
Because of time constraints, the prototypes presented were all lo-fi to various degrees:
- The Pilot study used pictures instead of 3D products, which can severely impact the immersive capabilities the participants have when asked about their opinions and first impressions.
- The main study used a survey that only used pictures and text. This means that instead of using 3D prototypes, pictures were used instead. Furthermore, the sound was replaced by text (question 2 and 4) and the animation screen was replaced with concept images without any dynamic effects (question 3). This could potentially severely influence some results compared with how it would be using real prototypes.

2. The identification instead of deep dives
We wanted to create a blueprint for how to further conduct research in the area of anthropomorphism and user experience in relation to smart products. But with a broad understanding anthropomorphism and a focus on the different potential fields or future research, some could say that each theme was not focused on deeply enough.

5.3 The research question and a new understanding of the problem
We think that the results of this paper help filling the research gaps we intended to fill. By providing a study with an overall focus on the themes within anthropomorphism and user experience on smart products, a blueprint can be generated that can help future research identify their in-depth research. All the data in this study is based on previous research from industrial and emotional design combined with informatics and HCI. Furthermore, this research was combined with the results from the pilot and the main study, to verify that the themes listed are actual areas of concern that could benefit from in-depth research in the future. Because of this, the results we got were closely related to our topic.

5.4 Future research
This work has generated some important insights into how future research in this field could be conducted. In our case, we have found multiple ways future research can be improved, all of which can be summarised into two areas: Prototypes and themes.
Starting with the prototypes, since these studies were conducted throughout a limited timeframe, hi-fi prototypes couldn’t be used and pictures presenting concepts were used instead. We think that the use of physical objects with actual displays and sounds would create a completely different impression for the participants - potentially generating different results compared to what we got this time.
Moving on to the themes now. We believe that the themes we ended up highlighting within this field of research could’ve been investigated a lot deeper. Furthermore, these themes could also be put in relation to other areas within HCI and not only user experience
which we focused on. By doing this, a lot more research could be conducted, creating a more elaborate database of knowledge for research in specific areas that could create new trends. Lastly, this increased web of research we just discussed, would also benefit the designers who are trying to increase the user experience with their anthropomorphic designs by knowing what to do and what they shouldn’t do.

Lastly, we do believe that by doing this, tangible interaction can be stretched even further. This is just one area where a stretch would be very interesting, especially considering that we’re already used to assistants and smart technology as it is. This way, we could potentially move one step closer to what we have been fantasising about for so long, the robot servants that were mentioned in the beginning of this paper.
References


Kuniavsky, M. (2010). Smart things: ubiquitous computing user experience design. Amsterdam: Morgan Kaufmann Publisher


Appendix – Main Study Questionnaire

LET'S MAKE A COFFEE

Age: ________

Gender/Sex
☐ Male       ☐ Female       ☐ Other       ☐ Prefer not to answer

Level
☐ Bachelor   ☐ Master       ☐ Phd         ☐ Staff       ☐ Other

Average coffee consumption
☐ Several times a day
☐ Once a day
☐ Couple of times a week
☐ Couple of times a month
☐ Rarely
☐ I don’t drink

Pick the coffee machine you’d like to use.

A  B  C  D
2. Now the coffee machine turns on, which sound would you like to hear?
   A. Beep  
   B. "Hello/Goodbye" (voice)  
   C. No sound

3. And which start animation would you like to see?
   A.  
   B.  
   C.  
   D.  
   E.  
   F.  

4. Now your coffee is ready, which sound from the coffee machine would you like to hear?
   A. Beep  
   B. "Your coffee is ready!" (voice)  
   C. No sound

5. To increase sales of this coffee machine, which of these advertisements is more appealing to you?

   A. Hiya, I am Mr Coffy and I am here to make your day a better, by making you lots of joyful cups of coffee to take your mind off your responsibilities and to serve your guests at home.
   B. This is our new, improved coffee machine created to make your day better with great coffee at home or at work. It's always ready to create the cup of coffee you need to help you go through your day easier.

   I am not like any other coffee machine, I am a "real machine" with curves. My display is not just a menu screen, it is my way of interacting with you, and when the coffee is finished I will tell you when your coffee is ready.

   This machine has a modern design with a simple and clean selection menu that is easy to understand. When the cup is finished, it will go quiet with the text "your cup is finished, enjoy your "coffee name" so you know when it's done.

   Let me help making the cup of coffee of your dreams to make your day better as as good as it can be!
   With coffee of this quality you'll can't go back to what you had before, get your coffee machine today.
Please fill in what you feel fits you the most.

How important is it that the coffee machine is smart?

0 1 2 3 4 5
(Not important) (Very important)

I feel like the addition of human/animal elements on products increases the experience.

0 1 2 3 4 5
(Disagree) (Agree)

App compatibility/remote possibilities to the coffee machine is important to me/is something I want.

0 1 2 3 4 5
(Disagree) (Agree)

Thank you for your answers, now some interview questions

Coffee

Can you explain your options?

Coffee

Did you like these designs?
If no: What do you think is unnecessary to add on a coffee machine?

Coffee

Please describe how you would like your coffee machine to be like if you could pick the design, functions etc.

Coffee

Do you have a special relationship to your daily objects, such as almost like a friend? Why?
If Yes: What elements would you like to add to make the machine feel closer to you?
If No: Do you think that the addition of human/animal elements can make you care more for a product?
Appendix – Lo-fi visualizations

Here are the lo-fi visualizations that were used to get a better overview of how the results were as well to show the participants of the main study their “own designs”. Some of the advertisements in these pictures have a purple outline, this outline represents the anthropomorphic advertisement alternative.