How to design and market the next generations of Autonomous Domestic Mobile Robots?

Exploring The Uncanny Valley, anthropomorphism and zoomorphism, social products, and robots with a personality.

Master's Thesis

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Abstract:

This thesis discusses how to design and market the next generation of autonomous domestic mobile robots now and in the future.

To facilitate this, two sub questions were constructed asking how present autonomous domestic mobile robots are interacted with and perceived. As well as how future generations of autonomous domestic mobile robots are imagined and perceived.

Taking an experimental approach, relevant literature was reviewed, and qualitative data was collected in the form of a focus group and five in depth interviews.

The Uncanny Valley framework was found to be central in understanding why some robot designs are more appealing than others, and autonomous domestic mobile robots or ADMRs as the will be denoted, apparently has a unique nature. Users were found to attribute human or animal form to these machines making it possible to classify them as social products with a personality.

When designing and marketing these products some of the conclusions are that companies should promote the personality of the robot, prioritize the possibility of customization, thoroughly test the social attributes of the robot and select brand names that evoke a feeling of familiarity and positivity among the consumers.

1 Introduction

The introduction will briefly discuss what a robot is and lie out market data, about the service robot industry, to show that we are in the middle of a revolution.

The theoretical framework, The Uncanny Valley, will be brought up, to explain the challenges robot designers and marketers are facing and why autonomous domestic mobile robots (ADMRs) are interesting to study in this aspect.

To strengthen this, ADMRs will be classified as social products and the Domestic Robot ecology (DRE) will briefly explain how these social products are affecting the dynamics of our homes.

Lastly the marketing aspects will be brought up, namely how to design and market the next generation of ADMRs. The main topic of discussion in the end of the thesis will be concerned with this.

The introduction will lead up to the Delimitation where the research question and several sub questions, will be presented. Also the form of the assignment will be made clear.

1.1 What is a robot?

Man has envisioned robot-like beings working for us for hundreds of years. From Leonardo Da Vinci's sketch of a mechanical knight to Star wars containing imagined robots of the future. The word "Robot" or "Robota", meaning serf labor or drudgery in Czech (Winfield 2012), was however first popularized in 1921 by Czech playwright Karel Capek in one of his plays "Rossum's Universal Robots" (Gates 2007), and now it seems to spawn a never-ending discussion about what the definition is. Two authors defines a robot as:

> *- an engineered machine that senses, thinks, and acts. Thus a robot must have sensors, processing ability that emulates some aspects of cognition, and actuators (Lin, Abney og Bekey 2011).*

> *- an artificial intelligence that can sense its environment and purposely act on, or in that environment, an embodied artificial intelligence, or a machine that can autonomously[1] carry out useful work (Winfield 2012).*

[1] Meaning on its own with a certain amount of intelligence (thorough description follows).

Most people would probably picture a robot as sort of physical machine moving around on its own as the above definitions suggest, but what about Google is that a robot? Is your smartphone? It is difficult to say and the definition is likely to change over time.

1.2 The robotic revolution

According to many sources robots will revolutionize most aspects of the world as we know it within the next 40-50 years. (Nourbakhsh 2013) (Winfield 2012) (Gates 2007) (Young, et al. 2008).

While industrial manufacturing robots have been around since the 1950s (IFR 2012), the biggest change lies with service robots as they will become more a part of our lives as they soon will become common practice in warfare, and the public and domestic arena (Nourbakhsh 2013) (Winfield 2012).

More and more money is being invested in robotics while parts are getting ever cheaper and easier to manufacture due to advances in technology. Last year 400 million dollars in venture funding was put into robotics in the USA. Google and Amazon are buying up robot companies, and in 2002 the first service robot manufacturer (iRobot) was listed on the stock exchange (Morton 2014). Also robot competitions exist to push the development even further. Among these are the DRC (DARPA[2] Robotics challenge) where you can win 1 million dollars and the RoboCup, a robot soccer world cup (Morton 2014).

In his article "A robot in every home", Bill Gates predicts that the future of robotics will evolve in much the same way as the personal computers did by following Moores Law[3]. According to him robotics is now at the same stage as computers were in the 70s. Many things need to be resolved before robots can safely share physical space with humans, and it has proven difficult to have robots do things we take for granted like recognizing objects, maneuvering past obstacles, grasping objects with the right amount of pressure among other things, but solutions are already on the way (Gates 2007).

At the moment the Robot Operation System (ROS) is being researched. What really gave computers a push in the early days, and what robotics still lack, was the standardization of hardware components making it possible to further standardize the operating system. Today you more or less have to start from scratch if you want to build a robot (Gates 2007).

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[2] Defense Advanced Research Projects Agency.

[3] Processing power will double every 1-2 years.

1.2.1 Market data and forecasts

The website of The International Federation of Robotics (IFR) will provide most of the data in this section. Their purpose is to help the worldwide robotics industry by keeping track of market data and statistics as well as promoting the industry to the public.

From 2011 to 2012 the increase in service robots sold for professional use was a modest 2% from 15.776 units to 16.067 units. The forecast for 2013-2016 is however that 94.000 new units will be installed (www.ifr.org 2014).

As seen in Figure 1 defense takes up the biggest part with about 40% of the units in use and field robots for agriculture the next biggest with 33%.

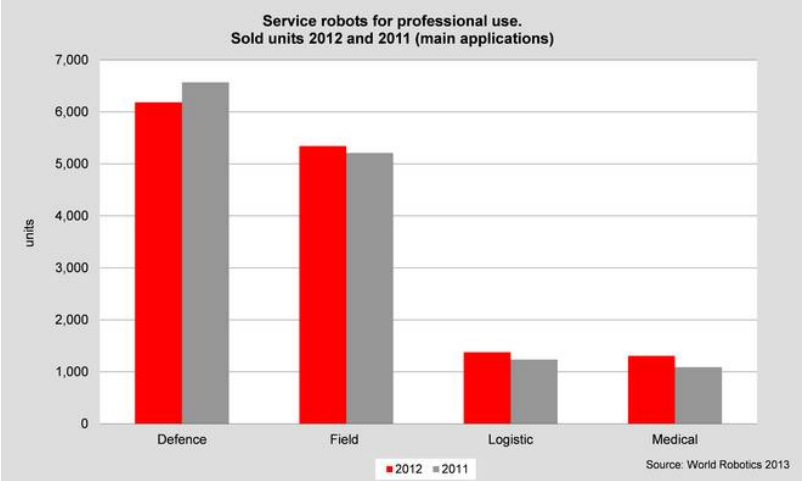


Figure 1 - Service robots for professional use in operation (www.ifr.org 2014)

Regarding robots for domestic and personnel use, there were sold 3 million units in 2012, which is 20% more than in 2012. This accounts for an increase in sales of about $1.6 billion (www.ifr.org 2014).

So far, service robots for personal and domestic use are mainly in the areas of domestic (household) robots, which include vacuum and floor cleaning, lawn-mowing robots, and entertainment and leisure robots, including toy robots, hobby systems, education and research (www.ifr.org 2014).

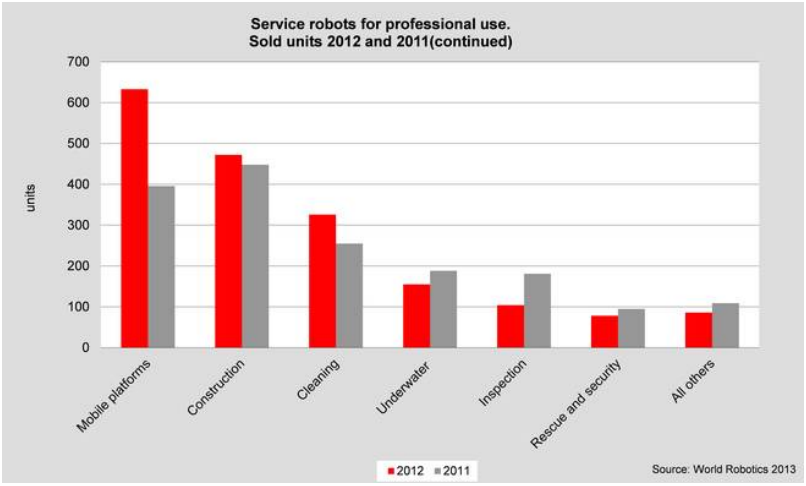


Figure 1 continued (www.ifr.org 2014)

Robots for handicapped people were expected to increase on a faster rate, but the future still looks promising (www.ifr.org 2014).

The forecast for 2013-2016 is that about 22 million units are to be sold worldwide, where 15,5 million are household robots for domestic tasks like vacuum cleaning, lawn-mowing, window cleaning and other drudgeries (www.ifr.org 2014).

But robots for entertainment are also predicted to heavily increase in numbers as seen in Figure 2 below.

Looking further into the future the Japanese Robot Association predicts that by 2025 the personal robot industry will be worth more than $50 billion a year worldwide, compared with about $5 billion today (Gates 2007). By 2020 it could very well be that everyone owns one or two robots for cleaning or other drudgeries. Even robot companions could be a reality by 2025 (Winfield 2012).

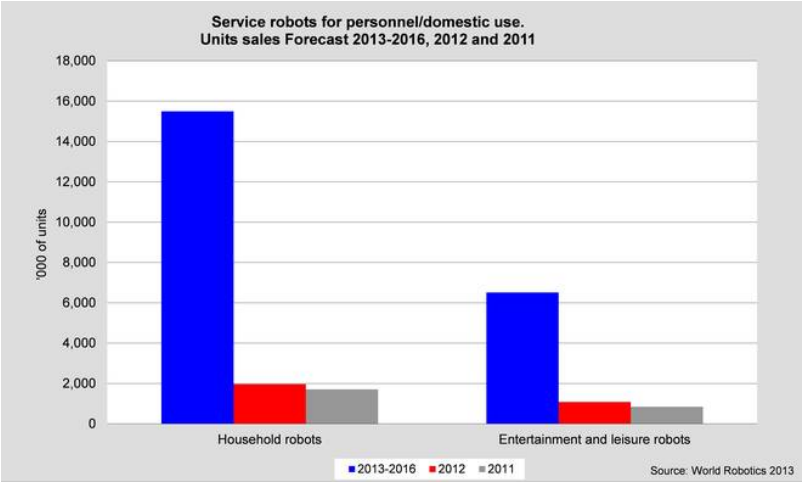


Figure 2 - Service robots for personnel/domestic use. Forecast. (www.ifr.org 2014)

1.3 The Uncanny Valley

In robot-research "Human Robot Interaction" (HRI) is a big subject. It is important to find out how robots should act around humans in order for us to accept and adopt them. How should they "look" at us? How should they touch us? How should they move? How should they talk? etc.. Especially in our homes this is relevant and it is becoming increasingly important to understand the process of long-term adoption of these devices. The user needs, characteristics of the home, and the (social) impact that these devices can have on the ecology of the home, as will be explained later, should be taken into account (Fink, Bauwens, et al. 2013). A small miscalibration in this aspect and we might find the robot uncomfortable.

On the contrary, if everything is calibrated correctly humans might develop strong emotional bonds with the robots. Maybe even fall in love with them, if we are talking more humanoid robots in a distant future (Russell 2009).

In 1970 a Japanese roboticist, Masahiro Mori, made a framework that predicts the affinity or familiarity, of a robot as it gets closer to resembling a human both regarding movement and looks (Figure 3).

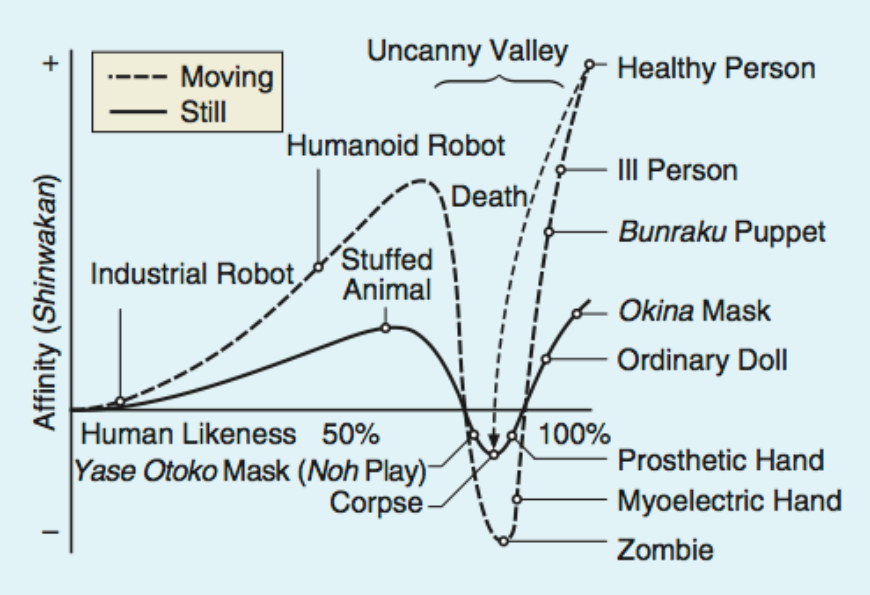


Figure 3 - The Uncanny Valley (Mori 1970)

Surprisingly his allegation was that Human Likeness and Affinity is not proportional. He claims that we would be more attracted to a clunky mechanical teddy bear than a robot looking more like a human. This, of course, always depends on the specific design and behavior, when making this kind of comparisons, but generally it makes good sense. When something looks almost like a human, but not quite, our brain tells us we should keep a distance. Some of the examples he gives are a corpse, zombie, prosthetic hand and a sick person. If movement is taken into account the effect is amplified, as seen in the figure.

MacDorman, Ho and Pramono (2008) argue that The Uncanny Valley is associated with the fear of one's own mortality and with disgust, as an evolved mechanism for pathogen avoidance. When a robot looks like a human at first glance, but has some uncalibrated movements, gestures or facial expressions, we get repulsed so we do not risk catching some kind of infection. Our brain is simply not equipped to understand this in its basic sense.

At the time of publication, this figure did not get much attention, but in recent years it has been widely used and discussed when creating new robots. To an even greater degree it is used in animation for movies, computer games, and animated assistants in different contexts (MacDorman og Kageki 2012). For example, Disney deliberately animates their character to be less human so people will regard them as cute and be able to just focus on the story (Stix 2008).

The figure was made from Mori's imagination and knowledge about robotics. No empirical data supported his claim. Since then many have tried to determine more precisely when and why you enter The Uncanny Valley, also whether it actually exists or to what degree. A final conclusion still remains.

1.3.1 Robot examples

If we start from the left side of the curve the first example could be the robot Hal 9000 from the movie 2001: A space odyssey directed by Stanley Kubrick.

This robot has no real physical presence, only a red lamp and a voice. We are not especially attracted to this design, nor are we repulsed.

Picture 1 – Left, Hal 9000 from 2001: A space odyssey. Right, industrial robot arm.

Also most industrial robotic arms lie in this category. They can do what humans do at a production line and they are formed similar to a human arm, but they hardly resemble humans in any other way nor evoke any attraction in us apart from that we might like the color or shape. We regard them merely as machines and though we know it is dangerous to be in a factory around heavy steel robots assembling cars for example, they do not repulse us on an emotional level.

One attempt to move away from this complete detachment of affinity and gain some likability is one of the newest additions to the industrial robotic arms, The Baxter.

This is clearly an industrial robot, however it is lightweight and safer to be around. Also it is the first of its kind to be affordable for small and medium size companies. The interface is a user-friendly LCD panel that mimics human facial expressions as it operates or is being programmed for a new task. The addition of this single feature makes it able for us to attribute

Picture 2 - Baxter from Rethink Robotics

some familiarity to the robot as we communicate with it. The idea is to make us feel more comfortable around it and make it easier for us to discern when it has understood something and when it is operating correctly or incorrectly. However having one of these at home, most people would probably still find it a bit too mechanical and dangerous.

The robot vacuum cleaner lays closer to the peak of the curve. It moves around your house cleaning your floor while you spend your time doing something else. As we shall see later due to the fact that it moves around autonomously and has an unobtrusive design, people tend to familiarize with the robot and feel good around it. Some even describe it as cute and silly.

Picture 3 - Roomba vacuum cleaner from iRobot

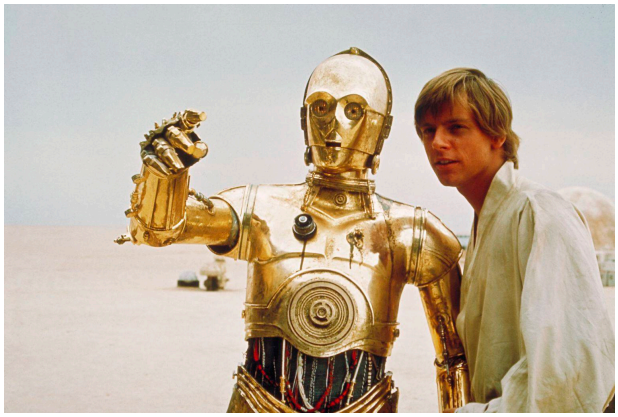
At the very top of the peak in affinity and likability before the valley we have the famous robot from Star Wars, R2D2, and numerous animated characters from cartoons, for example Wall-E.

Picture 4 - Left, R2D2 from the movie Star Wars. Right, Wall-E from the movie Wall-E

These robots only evoke positive feelings in most people and you feel they would be adorable to have around. Their human emotion and likeness is just enough for us to like them and the social intelligence they exhibit is optimized to be charming and welcoming. With the technology and trends of today, this would be the optimal design and behavior to strive for, in some nuance, when creating the next generations of robots according to the framework. It seems iRobot's Roomba has proven this to some degree. This level of affinity is probably restricted to the animated and fictional world for now, the same way people will always look cooler and more beautiful on the big screen, than what is possible in real life.

Also at the top, however slightly on the downhill after the peak, we have R2D2's companion in the movie C3P0 and one of the first real robot companions, Nao.

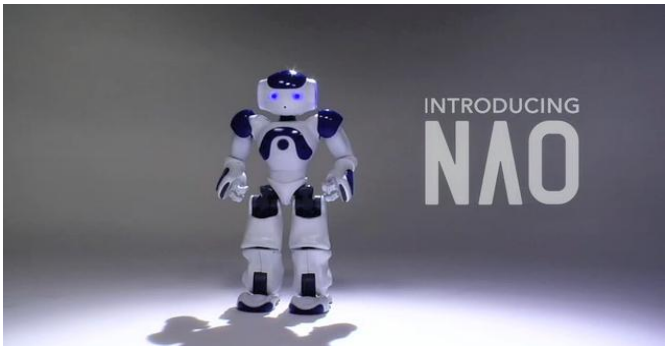
Contrary to R2D2, C3PO is a humanoid robot. We feel in no way threatened by the robot, but it does move like a human with very stiff legs and the voice is mechanic and robotic. The chunkiness does not go well with the humanoid form. This is also the case with Nao.

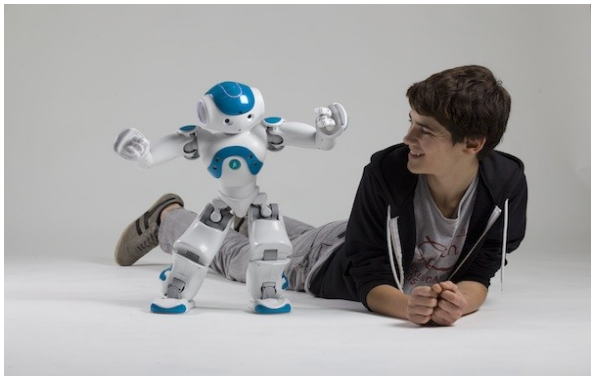


Picture 5 - C3PO from the movie Star Wars

This robot is a small humanoid robot and the company, Aldebaran, describes their robot as a small, cute, round and friendly companion around the house. *He moves, recognizes you, hears you and even talks to you!* (www.aldebaran.com 2014)

Just from the pictures you feel some attraction to the unit and maybe want to try and touch it or talk with it out of curiosity. However the voice is also somewhat robotic sounding and when it moves around it is still quite clunky, and some work needs to be done before it can be completely accepted.



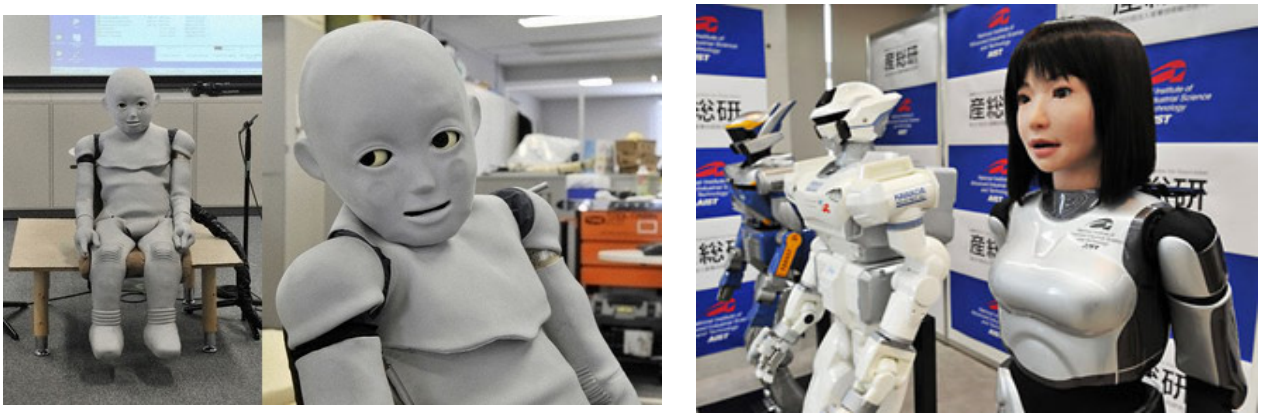


Picture 6 - Nao from Aldebaran

As soon as the robot takes a humanoid form we expect it to act humanlike. If this is not done properly we already at this stage start to get mixed emotions.

When we move closer to try and create robots that look like humans we quickly plunge into the valley.

The robot CB2 from Osaka University in Japan is a child robot designed to study how children learn. The female robot HRP-4C or Divabot from the National Institute of Advanced Industrial Science and Technology (AIST) in Japan, is made for the entertainment industry able to dance and sing. Finally the Geminoid-DK from Aalborg University in Denmark is tele-operated and made to act as humanlike as possible, experimenting with facial expressions and gestures. Also it is made to look like its creator Henrik Scharfe.



Picture 8 - Left, CB2 from Osaka University. Right, HRP-4C (Divabot) from AIST.

When looking at these robots most people will feel the eeriness, as they do not look quite right. Also when seeing them move and talk in video clips this feeling gets amplified. Imagining robots like these helping out at home for example will put most people off.

Picture 7 - Geminoid-DK from Aalborg University.

To cross and break free of The Uncanny Valley robot designers need to have the robots look and act like real, healthy and charming persons it seems. This is however very difficult as people through evolution have fine-tuned how we react to each other. We notice the smallest movement in the eyes, nose, mouth etc. when we communicate with each other. Even the slightest miscalibration and we might reject a person to some extend. The same goes for humanoid robots.

We can roughly agree on where a robot lies on the curve, however the more precise position is probably determined by a person's individual experience and taste. As with attraction in general we differ a little bit in what we think is cute and repulsing.

Also trends and culture must have a saying in what lies at the top of the curve. As we get more familiar with robots and they become less alien to us, we might accept more and more humanoid ones in the future.

One of the interesting areas where this concept comes into play these days is with the advent of the domestic robots. These robots have to have optimized designs and behavior to be accepted into the home, more so than in the industry and in public scenes. In the end they have to be highly personalized to fit the norms of every home and able to learn the differences. Also the mobility and the actions a robot takes, which are out of our control due to its autonomy, play a significant role in our perception of the robot as indicated by the framework.

Autonomous domestic mobile robots or ADMRs is therefor an interesting group of robots to study this effect on, and how we interact with them in general.

1.4 Autonomous domestic mobile robots

The market for domestic robots is an interesting market, as there seems to be a great willingness to own one of these robots. However not many products are advanced or appealing enough yet (Sung, Grinter og Christensen 2009). The Roomba, however, is successful, but it is only taking care of vacuuming, which is one of the many drudgeries we would like robots to take care of.

Compared to all the other home appliances we own, like the dishwasher, smartphone, microwaves, baking machine, security alarm etc. these ADMRs distinguish themselves from being mobile and autonomous (Young, et al. 2008). In other words they take up their own physical space when they move around the house with "a mind" of their own, thereby becoming a "social product" like the Roomba (Forlizzi 2007). Forlizzi (2007) talks about the five dimensions of a product:

- Function
- Aesthetics
- Symbolism
- Emotion
- Social attributions

These factors, alone and in combination, trigger a process of sense making through which cognitive, physical and emotional responses are triggered to link the familiar to the unfamiliar. Regular home appliances, like an oven, blender and a refrigerator, are described in functional terms and maybe aesthetic and symbolic terms, whereas social products also are described with emotional and social terms (Forlizzi 2007).

In our eyes this can to some degree make them seem "alive" and we might start to treat them accordingly (Norman 2005).

The Roomba is just one example of an ADMR. In the future there will be many robots that perform other tasks like other forms of cleaning, cooking, tutoring or companionship. All with different designs, sizes and ways of moving, talking and perceiving its surroundings.

Most of the argumentation in this thesis will be based on the findings from long-term studies of the Roomba. However, some of the conclusions will provide useful insights for future ADMRs with other functionalities than just vacuuming. The robot vacuum cleaners have only been on the market since 2002 and are among the first service robots that enter our homes, making this field very new and uncharted (Hendriks, et al. 2010). Also other ADMRs exist like the robot lawn mover, the robot pool cleaner and the robot gutter cleaner, however these do not interfere as much with the residents of the house as they work outside. Robot scrubbers exist as well

and work inside the house, but are far less widespread than the robot vacuum cleaners.

The key studies from 2007 and onwards, that were found, were long-term and conducted at the participants' houses, which for the first time gathered empirical data on the subject. A Roomba was handed to the participants and during a period of up to one year the effects were studied via interviews and questionnaires.

As we shall see, there are many recorded cases where people attribute anthropomorphic or zoomorphic characteristics to these machines contrary to regular household appliances.

This means attributing human (anthropomorphism) or animal (zoomorphism) form to something that is not human or animal. For example calling a robot "cute" or "silly". It could also be giving it a name or gender, or even talking to it.

It seems this will keep happening to an even greater degree in the future, as new technology allows for more autonomy and more life-like design. An author argues that one form of affection that people can show to robots involves ascribing anthropomorphic or zoomorphic characteristics (Breazeal 2001). This means, for the manufacturers of the machines, that when designing the device it is very important to think about how it should behave and interact with its surroundings and not just its functionality.

1.4.1 Domestic Robot Ecology (DRE)

It has been found that each product in the home has its own ecology surrounding it (Forlizzi 2007), meaning that a product will to some degree change the environment in the house and in some cases the environment in the house will affect the operation of the product. This is especially important for social products like ADMRs as they on one hand interact a lot more with its environment than immobile "unintelligent" devices. On the other hand the environment and the actors in the house will have a great deal of influence of the operation of the robot.

As we shall see, it seems an ADMR can change the routines, social roles and interact with the residents' on a more emotional level, mediating changes to the social dynamics in the home.

Also there seems to be an adoption process that recurs when adopting these robots. This insight is useful for predicting the adoption of future products, however only to some degree, as products and application probably will change rapidly.

This initial framework is however only based on Roomba observations and will probably need to change or be adjusted when more advanced robots enter the home. Also the task and design of the robot must have a great deal of significance to how it interacts with the environment. A robot pet in the future must have a very different ecology than a robot window cleaner for example.

1.5 Marketing

The unique nature of robots brings out new possibilities, but also challenges in the business world. This is both when designing them to avoid The Uncanny Valley, but also how the story is told when marketing them.

If people come to see these robots as being somewhat alive, new and different approaches have to be considered when creating the marketing campaign.

These days many products are already being marketed as extensions to our style and identity. We want products that make us feel good, not so much technical impressive specifications as in the 80's and 90's. When products start to move around on their own and make their own decisions a new layer of demand arises on top of the others. They have to not just fit our style and look good *on* us, but fit our way of living so they are nice to have *around* us. How does it fit into our individualized lives?

To this end designers and marketers of robotic products need to start considering the "personality" just as much as the functionality of the product. The behavior is important for the success of a product that moves autonomously, which is different from other products (Hendriks, et al. 2010).

To this end customization might help satisfy consumers by ensuring they are getting a robot with a style and personality that fits their taste.

Finally, as robots have been a topic of discussion for hundreds of years, and countless worst-case scenarios have been presented, the audience is a skeptical one these days. Especially as more advanced robotic products are starting to become a reality. When something is regarded as a "robot" what effect does this have on the perception of the device? Maybe marketers also need to consider this when presenting it. Generally the symbolic value of having a robot needs to be investigated and addressed by marketers.

1.6 Delimitation

This thesis concentrates on robots for domestic use that have a physical presence, are mobile and autonomous (ADMRs).

It reviews and gathers all findings from empirical long-term studies of ADMRs, which to this day only consider robot vacuum cleaners.

Further more, it collects data by conducting a focus group and five in depth interviews to try and study how the next generations ADMRs will be imagined and perceived.

This will enable a discussion about the drivers of successful designs and marketing campaigns of future ADMRs. The Uncanny Valley, anthropomorphism and

zoomorphism, social products, and robots with a personality will be in the core of the discussion along the way.

1.6.1 Research questions

Main research question:

> ***How to design and market the next generations of Autonomous Domestic Mobile Robots?***

Sub questions:

> ***Sub question 1:*** *How do people perceive and interact with ADMRs in their home today?*
>
> ***Sub question 2:*** *How do people imagine and perceive the next generations of ADMRs?*

1.6.2 Target audience

The thesis is aimed at business leaders and marketers trying to develop and/or market ADMRs now and in the near future.

1.7 Form of the assignment

The assignment proceeds by answering the two sub questions separately, analyzing the findings and finally discussing how to market the next generation of ADMRs.

The first sub question is answered by reviewing literature, written by researchers who have conducted long-term empirical studies, which would not have been possible to conduct within the limits of this thesis. Eight articles from USA, Switzerland and Holland were found concerning this subject and studying it empirically (Table 1). Many of the studies lasted six months to a year, and in some cases the participants were given a Roomba as a part of the study.

The answer for sub question 2 consists of three parts: The review of one article "Sketching the Future" (Sung, Grinter og Christensen 2009), a focus group and five in depth interviews with five potential end-users.

The authors of "Sketching the Future" conducted a focus group studying what people wanted from future household robots. These findings were used to guide and inspire the focus group. The focus group also studies how people imagine and perceive future ADMRs, by discussing it in a semi-structured way with the participants.

The participants for the in depth interviews were asked to imagine and draw an ADMR they would like to have in their home in the future. Contrary to the respondents from "Sketching the future" and the focus group, these are probed for

the underlying motivation for choosing the specific functions and design of their robot.

Afterwards the findings are analyzed to answer the two sub-questions and facilitate the main discussion and conclusions regarding the overall research question.

Finally the conclusion will be listed and future research will be suggested.

Below inFigure 4 the form is depicted:

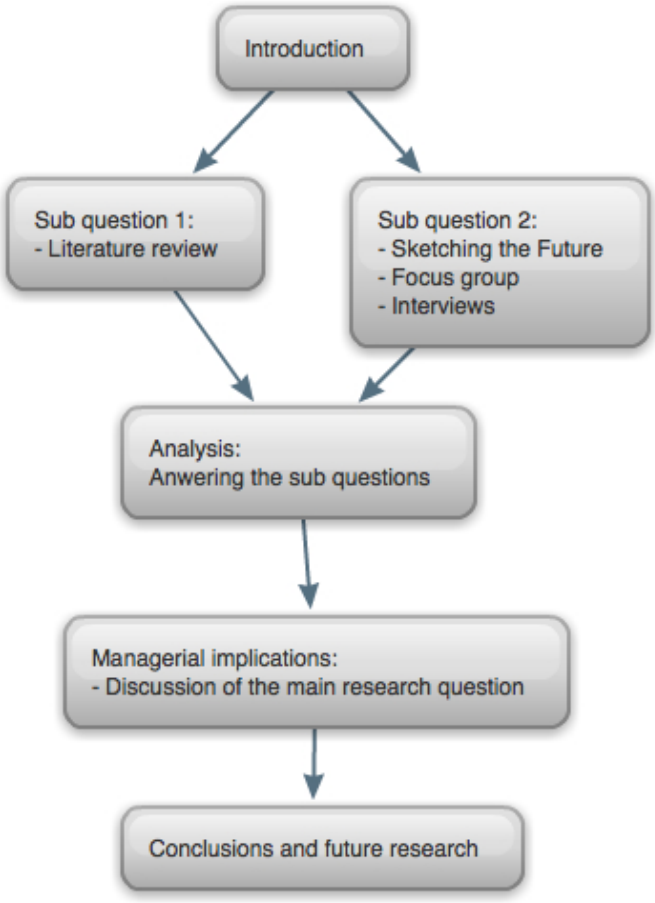


Figure 4 - The form of the assignment

2 *Sub question 1*

How do people perceive and interact with ADMRs in their home today?

In the following eight key articles from the literature will be reviewed to answer sub question 1.

The findings from these articles create the foundation for the claims in this study. They study, empirically, the effect of interacting with ADMRs in the long-term. Not many studies of this kind exist, as the field naturally is being developed along with the plethora of products available and the quantity installed in various households. As of now only studies of the Roomba Vacuum cleaner exist, making this the starting point for my argumentation.

These articles span from 2007 to 2013 and consist of eight empirical studies using both qualitative and quantitative methods of data collection. The core findings and research methods, in each article, are arranged in Table 1, as seen in the end of this section, in chronological order.

All of the authors make references to the work of Jodi Forlizzi (2007) who was the first to conduct an empirical long-term study in this field.

From their description in the various articles, all the authors are considered to be well-established researchers, whom can be trusted to have conducted a data collection and analysis of high quality.

Most of the articles were located by following the references in the articles that were found by searching the library database. This also provides security concerning the robustness of the ones that were chosen, as it was possible to note that many authors were citing these articles.

These article provide a good picture of how it is to live with an ADMR and many interesting behaviors from the participants are recorded. Also a new theoretical framework “The Domestic Robot Ecology” is developed.

2.1 Review of the articles

2.1.1 Groundwork

The first three articles form the foundation for the field and the findings all support each other. In the first article “**How robots become social products**” (Forlizzi 2007),

three households were handed a Roomba Vacuum and three other households were handed a more regular handheld upright vacuum, ”a Flair”[4].

The effect was studied during one year with several semi-structured interviews and visual diaries, which the participants had to fill out themselves.

Picture 9 - The Flair (left), The Roomba (right).

(Forlizzi 2007)

When analyzing the data the author was then able to see whether some changes occurred in the household, with the new ADMR, compared to the households with the new regular handheld machine.

The interesting part of what she found was that the participants, who got the Roomba, were anthropomorphizing the product, or attributing it a zoomorphic character because it moved around taking up its own space, and making “intelligent” decisions autonomously. She found that people were prescribing it a personality, even giving it a name and gender along the way. When participants were asked to describe the Roomba they used words like dumb, silly, cute etc. like you would with a person or an animal.

Furthermore she found that it changed the social dynamics among the members of the household. Usually the female head of the family would take care of the cleaning, but the Roomba changed this responsibility to be more evenly distributed between herself, the husband and the children, meaning they would all take part in starting up the Roomba, and moving it from room to room as it finished. Also, as the product is newer technologically speaking, the husband and children were excited to set it up and read the manual.

More so the Roomba needs a cleared floor to run on, which spawned a whole new array of tasks in the homes, like putting up chairs, moving small rugs, clearing wires etc. Also more permanent changes took place like rearranging the furniture and creating small blockades for the Roomba. This is known as “Roombarization” defined in “My Roomba is Rambo” (Sung, Grinter og Christensen 2007). It basically means that you make physical changes to your home to accommodate the Robot, like permanently moving your sofa.

Since vacuuming the floor becomes more of “a push of a button”, a change in frequency of cleaning was also recorded among the participants. Some would even run it every day.

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[4] The Flair is a new kind of vacuum that operates on battery and takes up less space, but basically is the same as a normal vacuum cleaner.

Also the robot became a mediating factor socially speaking. The family would sometimes join and watch the robot work to see how it would get around. Especially when the robot was docking itself to the charger it was funny to watch, one participant explained. Also children would put action figures on it, or even the pet cat, and watch it go around.

Lastly the robot was a hot topic when guests came over for diner, and in a special case its autonomy was used to successfully find a lost ring on the floor instead of searching for it manually.

Product ecology

Forlizzi also introduces the concept of an ecology surrounding a product or rather the robot in the home.

Ecology was initially a form of science used to describe the relationship between living organisms to the external world. Later anthropologists used the term to define the relationship that living beings have with organic and inorganic environments (Forlizzi 2007).

Recently, however the construct has been viewed as a window into another world, to incorporate other things like information, people, practices in a local environment, making it suitable for describing the dynamics and social relationships that people develop with robotic products and systems, she argues.

"The product ecology combines social ecology theory and an ecological approach centered in the domain of design to create a framework describing the relationship between a product and a group of people that develop a relationship through using it. The product ecology is an interrelated system of a product, surrounded by other products, often acting as a system; people, along with their attitudes, dispositions, norms, relationships and values; products; activities; place, including the built environment and the routines and social norms that unfold there; and social and cultural context of use (Figure 5). Important dimensions of a product include function, aesthetics, and symbolic, emotional, and social responses." (Forlizzi 2007, 131)

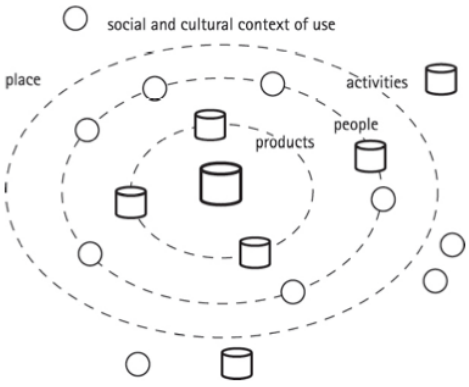

Figure 5 - A schematic diagram of a product's ecology, showing products, people, activities, and the environment and the social and cultural context of use surrounding a product.

In other words, the system is interlinked, meaning that the environment affects the use of the product, but at the same time the use of the product changes the environment. It describes the social experience of using the product and the mutual adaptation both psychologically and physically.

Each product has its own ecology and the people within the ecology have their own individual experience when using the product even if they are using it in the same way and for the same purpose.

Adding to this she defines a product as being a "Social product" if it is described in functional, aesthetical, symbolic and emotional terms with social attributions as well. Other products are only described with the first three terms.

To this end she defines the Roomba as a social product, as it was described in aesthetical and emotional terms along with social attributions.

She concludes that with simple social attributes, like gaze, negotiation, motion or speech incorporated into the design of the robots, people might adopt these machines even faster. Some light will be shed on this in the discussion part of the thesis.

Sung, Grinter & Christensen generally confirmed these findings with two studies presented respectively in "**My Roomba is Rambo**" (Sung, Grinter og Christensen 2007) and "**Housewives or Technophiles?**" (Sung, Grinter og Christensen 2008).

However, the participants studied here were Roomba owners who had bought a Roomba on their own free will, compared to Forlizzi who gave the participants a Roomba. In "My Roomba is Rambo" they even go for the enthusiastic owners found through a Roomba online forum.

In this study they first off collected data by searching and harvesting forum posts from www. rombareview.com and found that out of 760 posts collected 188 expressed some sort of intimacy with the robot. These posts were also used to screen users for recruitment for the in-depth interviewing part of the study.
30 enthusiastic owners were recruited and questioned over telephone and email. Most of the participants were from the US, but a few from Europe as well.
They found that the members of the households were thinking of cleaning with happier thoughts than before the adoption of the Roomba. They were neater because they had to clear the floor for the Roomba and felt more inclined to invite guests over to a clean house. Also the happiness for the Roomba was not generated from the efficiency, as it took longer than with a regular vacuum. It was generated more so by the intimacy they felt with the robot.
During the cleaning some described a new task - namely "rescuing" the Roomba from getting stuck. Further it was recorded that they would care for it like it was alive and watch it work like it was entertainment.

One participant would say he was playing with a robot rather than vacuuming the house. Also he did not approve of when the Roomba was marketed as a vacuum cleaner, as this title, according to him, did not encompass all it was. Another participant described it as something between a pet and a home appliance.

Generally many of the participants described the Roomba with anthropomorphic or zoomorphic characteristics and as a household companion.
They also noted that some felt like their Roomba had a unique personality even though they were aware that it had the same software as the others. When returning a broken one to the factory, it was emotional because they knew they would get a different one back.

Furthermore social norms were in one case ascribed to the Roombas as one participant owned two and would scold them when they collided in the cleaning process.

Also 21 out of the 30 participants had given the Roomba a name, and as they "got to know" it better some would change the name to something more appropriate for its "personality". Naming usually involved engraving or painting something on the chassis. Furthermore 16 of the participants referred to the cleaner in a gendered form and the authors argue that some participants to some degree had formed a relationship with the robots.

As noted earlier the authors introduce the concept of Roombarization, which they learned from the online forum www.roombareview.com. In this case they found that 27 of the 30 participants had made physical changes to their furnishing to accommodate the robot.

Lastly the Roomba was found to divide the cleaning responsibility more evenly among the members of the household also in line with Forlizzi's findings, and many acknowledged that they would show of the robot to friends and family or even buy new units for presents.

In "**Housewives or Technophiles**" (Sung, Grinter og Christensen 2008) the authors wanted to confirm the growth of domestic robots and to test the previous findings quantitatively on a bigger sample of Roomba users. Based on the findings from the above articles they made a questionnaire with 21 to 35 questions, depending on the answers that were given, and received 379 complete sets.
The questionnaire was distributed among users from USA through online Roomba forums and on Craig's list[5].

In Appendix II figures and tables are extracted from the article to give a quick overview.

[5] Popular website for private advertisements and discussion forums (www.craigslist.org).

Demography (Figure 1 in Appendix II)

Firstly they found that there was not much difference in use between the genders. 194 women and 181 men confirmed being users of the Roomba, and 139 women and 132 men said they were the primary user of the robot. Further they found that only 27 of 89 men, who lived with at least one other person, were responsible for cleaning prior to buying the robot. This confirms the previous findings that the robot seems to change the responsibility of cleaning to be more evenly distributed among both the males and females in the house, instead of being centered on the female head of the family.

The household composition was found to be 26% living alone, 43% living with other adults and 34% living with adults and children. Almost half of the respondents had pets and it seemed the Roomba was more popular when living with other people than living alone. However the authors do not comment on this distribution. They do however point out that households with children were significantly more satisfied with the robot than other households, scoring 4.93 on a scale from 1 to 7 compared to 4.53 for the users without children.

They also got several statements from the users supporting this in the “open answers” part of the questionnaire. Children were playing with the robot, giving it names and clothes etc.

The educational and technical levels of the owners were also covered, but two groups, as suggested by the title, were found to be too simple a segmentation and further research would be needed to determine this. However they found that everyone except 35 respondents had an undergraduate or graduate level of education, where 135 had an engineering related degree. Taking the education aside 182 (43%) self-identified as technical persons either as hobbyists or professionally speaking, 39% had technological knowledge, and only 18% were not usually attracted to technology, but the Roomba excited them.

Finally people were asked whether they liked sci-fi movies, but only 20% claimed to be fans.

Purchase (Table 1 and 2 in Appendix II)

As seen in the figures in table 1 and 2 in Appendix II, the authors also found several reasons why consumers bought their Roomba in the first place. The main reasons were “Through my or other’s experience (demonstrated, recommended, gifted)”, “Interested in new technology”, “Hate vacuuming”, and “Curiosity”.

In the next table they present the motivation for getting a second unit, which 71 participants had. The main reasons were “It was a gift”, “Loved the first one very much and wanted more”, and “Need to clean different parts of the home”. Apparently out of the 71 who got another one 54 got it within a year of the first purchase.

From the data they also got that the product was a popular gift especially for Christmas and housewarmings. Mostly women were the receivers.

Cleaning (Table 3 and 4 in Appendix II)

Many of the respondents changed their frequency of cleaning after installing the Roomba as seen in table 3 in Appendix II. When looking at the numbers it is clear that the Roomba induced more frequent cleaning. Also use of the Roomba on times when cleaning usually was not done was recorded. For example in work hours or while putting children to sleep.

In Table 4 in Appendix II, you can see that many would still use the regular vacuum to different degrees. Mostly for spot cleaning or thorough cleaning.

Next they also found that roombarization occurred with half of the respondents, and most of them did this soon after the Roomba was installed when they learned what difficulties it had. A few however did this prior to adopting the device.

Roomba culture (Table 5 in Appendix II)

As pointed out in previous findings, the Roomba brings about a whole culture of activities different from using more regular home appliances. The authors also find this trend among these participants, and in Table 5 in Appendix II the nine most frequent ones are presented; “Watch Roomba running for fun”, “Give a demonstration to others”, “Play and experiment”, “Ascribe a gender to Roomba”, “Name Roomba”, “Ascribe a personality to Roomba”, “Talk to Roomba (praise, greet)”, “Buy costume (dress up)”, and “Hack the internal system”.

They also found that people would describe the Roomba in anthropomorphic or zoomorphic ways like “doesn’t listen to me... like a man”, “it’s just a little crazy thing. It is kind of like me”, “naughty two year old”, and with words like “silly”, “temperamental”, “flirty” and “stubborn”.

Lastly the owners who took part in this culture were apparently more satisfied with the product.

More robots (Figure 2, Table 6 and 7 in Appendix II)

An optimistic growth trend in domestic robotics seems plausible as they discovered that most of the participants bought their robot within the last year as presented in Figure 2 in Appendix II, and one robot led to an additional unit or units in many cases. In Table 6 in Appendix II the distribution of the other types of robots owned by the participants, like the Scooba[6], Robomower[7], and AIBO[8] are shown.

Lastly you see in Table 7 in Appendix II that about half of the respondents owned at least one other type of robot.

2.1.2 Additions to the groundwork

The next two articles "Pimp my Roomba" (Sung, Grinter og Christensen 2009) and "Domestic Robot Ecology (DRE)" (Sung, Grinter og Christensen 2010) provide significant additions to the groundwork.

In "Domestic Robot Ecology" (Sung, Grinter og Christensen 2010) they build directly on the proposed ecology that surrounds every product (Forlizzi 2007). As Forlizzi (2007) they wanted to test the long-term effects of having a Roomba in the home. Only they did this on a bigger scale by handing out 30 Roombas to 30 households instead of only three.

During six months they visited the households five times to measure the effect, resulting in 149 home visits in the USA.

From analyzing the data they found four temporal steps that householders experienced while accepting the robot to their household:

1. *Pre-adoption*: During this process, people learn about the product and determine its value. Also, they form expectations and attitudes toward objects, which largely impacts the later user satisfaction.
2. *Adoption*: It refers to the first impression gained at the moment of purchase, or during the initial interaction.
3. *Adaptation*: During this period, people try to learn more about the artifacts by experimenting with complexity in use and compatibility in the current

[6] iRobot's mopping robot.

[7] iRobot's lawn mowing robot.

[8] Sony's toy dog.

environment, and make necessary changes to better incorporate it. Through this stage, people determine reaffirmation or rejection of further use.

4. *Use and retention*: It indicates the period when people begin to show a routine with a technology. Also, people show tendency to retain the use beyond the life cycle of the current product by upgrading it or changing to the next generation model.

As the adoption process progressed different ways of interacting with the robots were recorded. In Figure 6 below, the framework they came up with is portrayed.

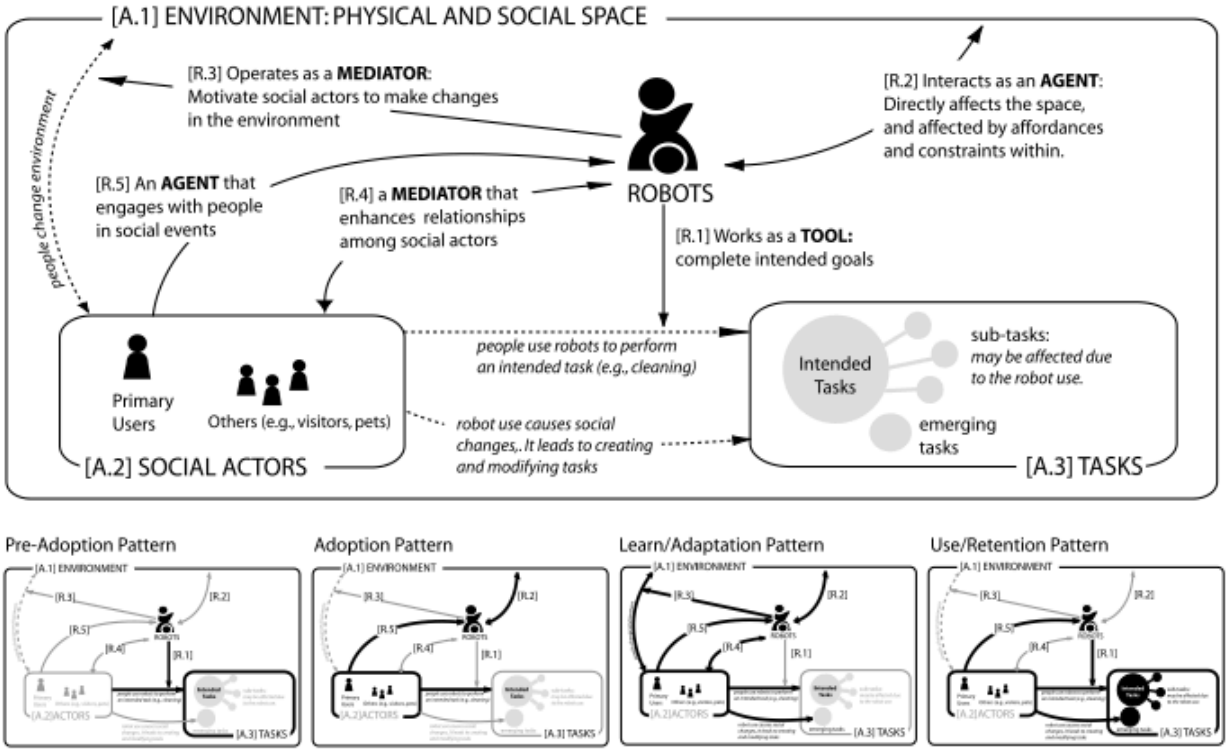

Figure 6 - Domestic Robot Ecology (Sung, Grinter og Christensen 2010)

Throughout the whole process five types of relationships were found:

- R1: *A tool* to perform tasks: robots served as a utilitarian tool to replace the manual labor, and to improve the quality of life.
- R2: *An agent* that directly impacts the surrounding environment: robots induced physical impacts, such as removing pet hair on the floor, and moving smaller objects during the navigation.
- R3: *A mediating factor* that motivates people to make changes in the environment: robots sometimes elicit negative impacts, such as breaking a mirror and dragging wires. The limited compatibility with the existing

environment mediates people to make necessary changes to incorporate robots better (roombarization).

- R4: *A mediator* that enhances social relationships among household members: in our study, we found that children and men took more responsibility in cleaning after robot adoption. Further, robots often became a new means for social activities. For instance, people demonstrated robots to the visitors, and even took them on their vacation to show around.
- R5: *An agent* that engages with people in social events: people ascribe lifelike qualities to a robot, and directly engage in social activities, such as giving names, genders, and personalities (social product. Anthropo- and zoomorphization).

As we can see from the figure, in the pre-adoption process only R1 is present, where in the adoption pattern R2 and R5 are determining the interaction and so forth.

In short they found, as Forlizzi (2007), an immediate change in the social dynamics within the household. They argue that it is important that future generations of ADMRs will have to fit into the social arena as a social product to be adopted successfully. Also their framework should be used to help future robot developers to understand how their robots are being used to create better ones that can maneuver around the house more easily.

In the end they stress that this is an initial framework that will have to be developed along with the evolution of robots. Already they suggest a sixth relationship, namely an agent that interacts with other intelligent appliances at home.

Also they note that robots will probably act more as a social actor than a tool and future generations probably will need less modifications to the existing environment.

In "**Pimp my Roomba**" they argue that studies have shown that when you are able to personalize your product in some way it enhances customer satisfaction. Among all these mass-produced goods today we are craving unique products we can relate to and identify with.

As part of the previous study "Domestic Robot Ecology" they tested this by giving half of the households (15) a customization kit consisting of stickers of many different shapes and colors. Also a coupon for getting

Picture 10 - Use of the customization kit (Sung, Grinter and Christensen 2009)

a free skin from www.irobotskins.com[9] was included. They wanted to see whether customization could be induced.

First of all they found that personalization can facilitate positive experiences, and can be induced to some degree. The reasons why the participants wanted to personalize the Roomba were found to be, to express the technology's proposed identity and to make it fit into the style of the home.

In the end they argue that the behavior of an ADMR is important for the success of a product that moves autonomously, as people will anthropomorphize and zoomorphize the products.

2.1.3 Research from Europe

The last three studies of the Roomba were conducted in Holland and Switzerland yielding findings that in some aspects oppose the previous ones.

In the first study "**Robot vacuum cleaner personality and behavior**" (Hendriks, et al. 2010) the authors want to determine the preferred behavior of a robot vacuum cleaner resembling the Roomba. The research was done in two parts. First a focus group consisting of six people was made to find the preferred personality by having the participants answer a questionnaire. Afterwards they created a video animation of a robot vacuum cleaner eliciting this personality and 15 new participants were called in to fill out the same questionnaire after watching the movie, to see whether the robot in fact had portrayed this preferred personality.

The personality traits that the first focus group would like the robot to have were a calm, polite, and cooperative robot vacuum cleaner that works efficiently, systematically and likes routines.

Also the 15 people who saw the video were able to detect these traits in the animation confirming that people do anthropomorphize or zoomorphize these products.

However, when studying the long-term effects in Switzerland, Fink et al. (Fink, Bauwens, et al. 2011) and (Fink, Bauwens, et al. 2013) yield some findings that contradict those of Sung, Grinter & Christensen and Forlizzi as previously stated.

In "**People's Perception of Domestic Service Robots**" (Fink, Bauwens, et al. 2011) the initial perception of having a Roomba for two weeks among 9 households was tested.

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[9] A skin is like a whole suit you can put on the robot. For example a shark skin or a lady bug skin. This website, however, seems to be deleted today.

Using both interviews and questionnaires they found that there seems to be a "family effect" regarding the attitude towards the robot. They seemed to share the opinion of the robot within the households in most cases. Also this attitude did not change much during this two-week period. As Forlizzi and Sung, Grinter & Christensen they found in the questionnaire that both men and women were using the robot more evenly, but from the interviews they conducted, it seemed mostly women were still the main users, contradicting the previous findings.

The study "**Living with a Vacuum Cleaning Robot**" (Fink, Bauwens, et al. 2013) also recently yielded some results that question the pioneering data.

The goal with the study was to also test the long-term effects of being given a Roomba, the same way as Forlizzi and Sung, Grinter & Christensen did. Using interviews, questionnaires and diaries the effect was studied in a period of six months in 9 households.

As they were aware of "The Domestic Robot Ecology" (Sung, Grinter and Christensen 2010) their aim was to contribute with European data to the model.

The similarities they discovered were that people anthropomorphized or zoomorphized the vacuum cleaner, roombarization occurred, it served as a mediating factor spawning conversation when guests came over, and finally the whole adoption process was found to be the same.

However the emotional bonds created with anthropomorphism or zoomorphism only existed in the beginning and dissipated quickly, like collaboration between an old lady and the robot and children playing with the robot. Naming and dressing up the Roomba did not occur to any significant degree at any time. Also the cleaning roles did not change in this experiment. To this end they argue that the social impact of the Roomba might be overestimated and after the third phase in the adoption process, the "Adaptation" phase, the robot will be perceived as just another cleaning tool.

As additions to the framework they found that it was important that the style of the robot matched the style and decor of the home. This might be due to the fact that the robot is supposed to be left out in the visible space of the home contrary to a regular vacuum, which you would hide in a closet.

Another finding contributing to the framework was that some participants felt the robot was intruding their privacy when it was moving around. On the other hand other participants did not want to use it while they were out of the house, as they could not keep an eye with it.

Table 1 – Findings from the Roomba Vacuum Cleaner research

Title	Author	Method	Findings
How Robotic Products Become Social Products: An Ethnographic Study of Cleaning in the Home.	Forlizzi J. (2007).	- Qualitative. - Interviews and visual diaries. - Long-term study. 12 months. - Compared a Roomba with a Flai (normal stick vacuum). - 6 households where 3 got a Roomba and 3 got a Flair. - Participants from USA.	- Anthropomorphism, zoomorphism. - A mediating role. - Roombarization. - Frequency of cleaning. - New cleaning roles in the family. - Change in product ecology
"My Roomba Is Rambo": Intimate Home Appliances.	JaYoung Sung, Rebecca E. Grinter and Henrik I. Christensen (2007).	Part 1 - Forum posts - Qualitative. - Forum posts collected: 760 Part 2 - interviews. - Qualitative via telephone. - 30 interviews with enthusiastic Roomba owners from Roomba forums. - Participants from USA.	- Thought of cleaning with happy thoughts. - They became neater because the Roomba needed a cleared floor. - Happiness came from the intimacy with the robot not efficiency. - Anthropomorphism, zoomorphism - Companion, pet. - Unique personality. - Roombarization definition.
Housewives or Technophiles?: Understanding Domestic Robot Owners.	JaYoung Sung, Rebecca E. Grinter and Henrik I. Christensen (2008).	- Quantitative and qualitative. - Online questionnaire. - 379 participants recruited on Craig's list. They wanted to test the findings from Forlizzi (2007) and Sung, Grinter, & Christensen (2007) on a larger sample, and find out the demographics of the Roomba users. - Participants from USA.	Consumer types: - Equally as many men as women own Roombas. - Mostly between 18 and 24 of age. - Households with children = higher satisfaction. - Most had at least an undergraduate degree. - Most bought one due to experience/recommendation, interested in technology and hate vacuuming. Also they found: - Frequency change in cleaning. - Roombarization - Roomba culture - Anthropomorphism, zoomorphism - Many owned at least one more type of robot.

"Pimp My Roomba": Designing for Personalization.	JaYoung Sung, Rebecca E. Grinter and Henrik I. Christensen (2009).	- Qualitative. - Six months. - 30 households were given a Roomba and 15 of those were given a personalization toolkit to see if personalization could be induced. - Participants from USA.	Personalization could: - facilitate positive experiences. - be induced. - express a technology's identity. - make it fit better into the style of the home. More durable and flexible customization materials should be made to accommodate collaborative personalization.
Domestic Robot Ecology: An Initial Framework to Unpack Long-Term Acceptance of Robots at Home.	JaYoung Sung, Henrik I. Christensen, and Rebecca E. Grinter (2010).	- Qualitative and quantitative. - Measured on a Likert scale as well as open answers. - Long-term. Six months. 5 visits. - Roombas were given to 30 households. - Participants from USA.	Framework for long-term interaction: DRE Four temporal steps: - Pre-adoption, Adoption, Adaption, Use and retention. Five types of relationships: - Replace manual labor. - Impact on physical environment. - Roombarization. - Social mediator between household members and friends. - Anthropomorphism, zoomorphism.
Vacuum cleaner personality and behavior.	Bram Hendriks, Bernt Meerbeek, Stella Boess, Steffen Pauws & Marieke Sonneveld (2010).	Part 1 – Focus group: - Qualitative. - 6 participants. - They should determine the preferred personality via a questionnaire. Part 2 - Video prototype was made: - Quantitative. - 15 new participants watched it and should think out loud what they thought. - They should then determine the personality by filling out a questionnaire like the first group to see if they had created the desired personality. - Participants from Holland.	Preferred behavior: - People prefer a calm, polite, and cooperative robot vacuum cleaner that works efficiently, systematically and likes routines. - People were able to detect this in the prototype video.

People's Perception of Domestic Service Robots: Same Household, Same Opinion?	Julia Fink, Valérie Bauwens, Frédéric Kaplan & Pierre Dillenbourg (2011).	- Qualitative and quantitative. - Interviews and Questionnaire. - 3 times over 2 week period. - Participants were given a Roomba for 2 weeks. - 9 households with 26 participants. - Participants from Switzerland.	People's perception: - Individuals may have different opinions about a domestic robot, but a household seems to share an opinion ("family effect"). - The attitude did not change over the 2 week period. - Not much difference in gender in questionnaire, but mostly females using it judging from the qualitative data.
Living with a Vacuum Cleaning Robot.	Julia Fink, Valérie Bauwens, Frédéric Kaplan & Pierre Dillenbourg (2013).	- Qualitative and quantitative. - Interviews, diary and questionnaire. - Long-term study over 6 months. - They were given a Roomba and were visited several times. - 9 households with 30 participants. - Participants from Switzerland.	Added European data to the DRE: - They found the same adoption process. - The design of the robot had to fit the residents' style. - It was intruding the private life when moving around. - Anthropomorphism, zoomorphism or emotional bonds showed in the beginning but dissipated quickly. (Social impact might be overestimated.) - Cleaning roles did not change. - Roombarization.

2.2 Criticism of the literature

This section will take a critical view on the articles and the findings within. Many things have to be taken into account when using these findings for the further argumentation.

First of all only one type of ADMR, the robot vacuum cleaner, has been studied in the literature, as very few exist to this day. In fact only one brand of robot vacuum cleaners, The Roomba, has been studied. This makes the literature to choose from very sparse as mentioned earlier. The articles do however provide a fairly broad picture, in spite of this, as the data in the articles is collected in both the USA and in Europe (Switzerland and Holland).

The data is primarily qualitative data and access was only possible to the articles, not the actual recordings or transcriptions. This could pose some misunderstandings, as the interpretation is based on the authors' interpretation of the data.

The field is very new, which means that everything probably changes fast. So when using data that is 6-7 years old from an article that is from 2007, might not provide a very good picture of the present situation. Maybe the novelty effect of the Roomba,

after hitting the mass market around 2005 (Morton 2014), does not make the first articles very realistic today.

In the article Housewives or Technophiles their recruitment strategy could generally be critiqued for being a bit biased towards enthusiastic owners. First of all by using an advertisement for the survey instead of asking random Roomba owners directly, resulting in the acquirement of participants who take action by themselves to join, and secondly by posting the advertisement on a Roomba online forum. The other articles might have similar weaknesses with their sample of participants. However, this early in the development of the field it is still very interesting and useful to see that changes like these, in the ecology of the home, take place even if it is not completely representative to robot vacuum cleaner or ADMR owners in general. It is still a significant amount of users and worth to take seriously, as a new development in the use of technological home appliances.

2.3 Sub conclusion

In this section it has been shown that ADMRs seem to have a unique nature, which people react to to some degree. The fact that the robot is autonomous and mobile can induce anthropomorphization or zoomorphization. Though it might be overestimated somewhat in the first articles, people will to some degree treat these robots as living entities, which makes for a whole new challenge or opportunity when designing and marketing ADMRs.

This section gathers finding from actual experiences regarding living with an ADMR presently, however it is limited to talking only about the Roomba vacuum cleaner.

To widen the discussion about how to market the next generations it is necessary to try and imagine future ADMRs and talk about needs and concerns of the users. The next section will delve into this.

3 Sub question 2

How do people imagine and perceive the next generations of ADMRs?

This section will be concerned with the data collection for this thesis. Also the method will be presented here.

The first part however reviews one article "**Sketching the future**" (Sung, Grinter and Christensen 2009), which is used to guide and inspire the succeeding focus group and in depth interviews. Also it contributes to the depiction of the attitude towards ADMRs in general.

3.1 Review of "Sketching the future"

By having 30 households (48 participants) attend a creative workshop, they were able to identify commonly desired tasks that robots could assist with, and derive design guidelines that promote acceptance of these robots.

None of the participants were robot owners and about 19 were described as technical.

The participants were to draw, or somehow visualize by creating a collage of magazine cutouts, a desirable robot to help them out in their home, and afterwards explain what they had made.

Overall they found 99 distinctive tasks that the participants would like the robots to be able to perform, resulting in three main categories:

- Time-consuming Drudgeries
- House-sitting
- Personal Attendance

In Appendix III the tables from the article showing the task-categories and their subtasks are extracted.

The most prominent category was Time-consuming Drudgeries containing tasks within cleaning, yard work and cooking. Then comes personal attendance in intellectual and emotional support, like organizing information, acting as an instructor, beauty support, relaxation, and entertainment. Finally house-sitting contained tasks within hygiene and health inspection, resource management and security control.

Generally they found that people wanted the robot to be able to perform multiple tasks like a Swiss-army knife (but not too big and noisy), and able to communicate with the different other appliances or robots in the home, but the final decision power should rest on the humans. The robot had to be controllable, be able to adjust to whom it is working for, and compatible with the domestic space. The home should not be adjusted to the robot. Also it should not have too much intelligence as the participants wanted to work *with* the robot, not have it do everything. For example it could help with cooking to some degree, it should not make the recipes and one said he would not trust it with a knife.

Regarding interacting with the robot they strongly preferred being able to give and receive voice commands as this would be easier if the robot was in places where buttons could not be pushed.

The function was generally more important than the form. It did not have to look like a human just make life easier, one however said that it had to look cute and adorable. Something you would want to have around. Another wanted it to be able to change form from tough security guard outside to more eye-pleasing when inside.

When it came to health check people wanted the robot to be intelligent enough to perform some tasks to reduce visits to the doctor, but only in collaboration with some human medical establishment.

Also there was some interest in having a robot that could keep an eye on the inventory, check for expired goods, and at the same time help reduce the use of resources.

As a security guard people generally did not want the robot to carry any weapons, but rather sound an alarm if anything happened.

Regarding personal attendance people clearly stated that they wanted a robot that acted as a professional butler, not as a friend. It should have highly developed social skills, but only a subtle helpful appearance. Also the form factor should somehow be pleasing for the eye regardless of it taking a humanoid form or not.

Regarding social skills it should be able to touch other people like humans do when interacting and talk with a tone of voice that makes for example children respect it. It should even have a sense of humor and be able to talk about personal things.

In Table 2 below the findings have been sorted into four categories; Form, Functionality, Emotional bonds and Concerns.

Table 2 - Findings from "Sketching the future"

Form	Functionality	Sociability	Concerns
- Not too big. - Quiet. - Don't need it to look like a person. Just do the work. - Transform from tough security robot outside and eye pleasing robot inside. - Had to look cute and adorable so you would want it around.	The participants reported 99 different tasks. Main categories: - Time consuming drudgeries - House sitting - Personal attendance (See Appendix III) - Social skills. - Controlled with voice commands.	- Some wanted a companion. - But more a butler than a friend. - Could entertain with jokes and talk about personal matters. - It had to be able to communicate with touch land affection like humans. - Able to talk with emotion in the tone like humans.	- Not too intelligent. - Want to work WITH the robot. Not have it do everything. - Final decision power should rest on humans. - The robot needs to be controllable, be able to adjust to whom it is working for, and be compatible with the domestic space. - Don't trust a robot with a knife. - Medical treatment only in consolation with a human medical facility. - No weapon on security robots.

There seem to be many tasks people want a robot to take care of.

However there are also demands on how the robot should behave when doing the task at home that have to be taken into account. Many concerns and social abilities need to be implemented into the robot before a successful product can be made.

Finally, the reasons why the participants wanted a robot were to have more time for children, pets, and personal development.

These findings were based on one focus group. The data collection will expand on this with another focus group that adds to the findings in Table 2 and five in depth interviews that delve into the underlying motives for wanting a robot.

3.2 The focus group

In the following the methodology and findings of the focus group will be presented.

3.2.1 Methodology

A focus group was conducted to try and get some insights into the general attitude towards the future generation of ADMRs. This was to expand on just the findings from the Roomba studies, but also to see what similarities might be found.

A focus group is a good way of gaining new insights to a topic, and one way to put it is; *a group interview with a clearly and precisely defined topic, with a focus on enabling and recording interactive discussion between participants* (Saunders 2012, 400) - in other words, encouraging discussion and thinking out loud, within the confines of the topic. This makes it possible to get novel insights you could not have gotten if you had controlled the interaction more by having each participant answer one question at the time for example.

This, rather unknown, subject demands a bit of creative thinking, as we are dealing with products that do not exist yet. This is nicely suited for a focus group discussion, as the participants get inspired from each other's ideas and new ideas and thoughts emerge no one would have thought of in isolation.

Also the approach was "deductive" since the interview guide was based on the literature and my preliminary research question (Saunders 2012, 548).

This was done with five participants and myself as the moderator in a semi-structured way. Choosing a semi-structured way was to keep it explorative, but still have a discussion within the areas that were important to debate. To show how far we have come, it was the plan to show a promotional video for the Neato BotVac™ (BotVac 2014) at the end of the interview. The robot vacuum cleaner was however brought up multiple times throughout the interview, as everyone apparently knew about it already.

To come about the difficulties with talking about these imaginary products, friends who were able to cope with this, not afraid to share their opinion, and take the discussion to the next level, were recruited. They were considered having creative and innovative minds and highly educated. However, as seen in Appendix I, the questions that were asked were very simple and easy to comprehend - not trying to force a particularly high level of discussion. The participants all more or less knew each other, which was thought to yield a nice and relaxed discussion where everyone easier could express himself or herself without being afraid of what other people thought of them.

Further, it was a requirement that the participants owned their own place making them responsible for their entire apartment or house, not someone who was renting a room. This was to make sure they had most of the responsibilities a domestic robot could mitigate. Also it is assumed that you tend to care more about who or what is in your home if you own it.

Besides that, the group was made as heterogeneous as possible with three females and two males attending as different opinions might exits among the sexes. It was important that the participants had different marital status, as the views of a participant with children probably would differ a lot from one living alone or with a roommate with this subject. The robots might have to be safer with children around or other tasks were called for. Also it was good that they had different job/knowledge areas, different ecologies in their home, and different views on the society we live in to broaden the discussion.

Jonas

27 years old, project leader, owns his apartment, has a roommate, and single.

Niels

25 years old, student and rents an apartment with his girlfriend.

Thea

31 years old, architect, owns her own apartment, lives alone, and single.

Julie

30 years old, project leader and visual artist, owns her own apartment, lives alone, and has a boyfriend.

Jannie

31 years old, food and health specialist, owns a house with her husband, and has a 2 years old son.

Throughout the session it was important to interfere as little as possible, but once in a while elaborate on certain statements from the participants to encourage discussion. Also everyone should be contributing to the discussion. This was done by asking “What do you think Thea?” for example if that person had not said anything for a while.

The interview lasted just about one hour, and was done in the participants’ native language, Danish, recorded on an iPhone, and transcribed immediately after (Appendix I).

Lastly everyone was seated around a table in a meeting room while some drinks and snacks were available to make sure the mood was relaxed and welcoming, making the conversation flow as freely as possible.

3.2.1.1 The transcription (Appendix I)

The transcription of the conversation contains everything except for off topic or random talk, confirming “yes’s” and “no’s”, and sounds like “eh” and “hmm”. However if it was important for the statement then these were included as well. Also, who was talking to whom or commenting on whose statement, was only transcribed if it was not clear from the progression of the conversation. Besides, most of the time the participants were not talking to anyone specific, but to the whole group.

Furthermore the tone of voice or mood subtleties of every statement was not written down. Where nothing is stated it is implied that the person is speaking in a regular serious conversation mode, however when people where joking this was clearly stated after the sentence.

General observations and moods of the participants or group were written in brackets throughout the transcription.

Lastly the lines were numbered making it easier to make references to the document.

The interview was transcribed to really make note of what the participants actually were saying. It is much easier to decipher the meaning behind the words when you can see them written. Also it gives a quicker overview of the whole interview making it easier to jump back and forth.

3.2.1.2 Structure of the focus group

The interview consisted of six parts:

1. Short introduction to the “rules”.
2. Thoughts about domestic robots.
3. Delimitation to ADMRs (Function and emotion).
4. Sci-fi video clips (The Fifth Element and Äkta Maniskor)
5. Promotional video (Neato BotVac)
6. The world in 10 years.

Short introduction to the “rules”

This was to make sure everyone knew that this was an open discussion between the participants. They were told to say whatever they felt like by just associating to the next thing that entered their mind (Appendix I, lines 2-13).

Thoughts about domestic robots

Following the introduction, the discussion was initiated by asking the first question: *When I say robots for the home – what are your thoughts?* (Appendix I, line 13)

It was important to start the interview with a very broad discussion about domestic robots, to see what they would say without any further information or anything guiding them in some direction.

Delimitation to ADMRs

After this the discussion was narrowed a bit down to what this study is delimited to, namely ADMRs. The term "autonomous" was briefly explained before moving on to suggesting areas where these robots could be used now and in the future. The list of areas was derived from "Sketching the future" (Sung, Grinter og Christensen 2009) to make sure everything was thought of and no areas were promoted more that others. Hereafter focus was on the functional part of having a robot: *When you think about these tasks in the home how could a robot be valuable to you?* (Appendix I, lines 92-115).

Also it was interesting to know whether the participants, before even owning a robot, would acknowledge some sort of relationship equivalent to the ones people were recorded to have in the findings in the secondary data: *What kind of relationship would you get or would you like to have with a robot like this?* (Appendix I, lines 219-221).

Sci-fi video clips

To test the effect of The Uncanny Valley a video clip from the movie The Fifth Element (1997) and from the Swedish television series Äkta Maniskor (1. episode 2012) was shown.

The Fifth Element depicts a future where all life is threatened by the arrival of Evil. Only a fifth element, in the form of a woman, can stop this Evil (IMDb 2014). There are many suggestions to how cars, space travel, robots and people would look like in the future. The clip, which was shown in the focus group, shows three small robots that enter a room through a small hatch at the base of the wall to clean up a broken

glass on the floor. They look very “robotish” with no human features at all and collaborate to clean up the mess. Actually they resemble the Roomba quite a lot in looks.

Äkta Maniskor, however, depicts a future where *almost* human-looking robots serve their owners in the household more like a butler or an au pair girl. Many issues are brought up as the boundary between humans and robots start to blur. The first part of the video shown was an in-film commercial for the Hubot, as they are called, and later a dad, his son and the granddad enter a shop where the robots are displayed and sold. The last part shows them bringing one home in a box, opening it, and starting it up.

Picture 12 - Screenshots from Äkta Mänsikor.

Promotional video

Towards the end of the interview the reality of ADMRs today was shown, by showing a promotional video for the Neato Robot vacuum (BotVac 2014). The company presents the robot more closely to how it should be done with these robots in the future, according to the argumentation to come in this thesis. Regarding the functionality of the Neato, it seems to be a bit ahead of iRobot’s Roomba, as it is able to scan the room.

It shows the robot in action around the house while a narrator explains its abilities. The way it is portrayed is very life-like and part of the social ecology; almost like a cute pet. The Narrator uses many statements you would only use on living creatures to make it more alive, like “The most *clever*”, “It *sees* in the dark”, “off on a mission”, etc.

The full video can be seen at http://vimeo.com/89067382.

Picture 13 - Screenshots from Neato promotional video.

The world in 10 years.

In the end it was briefly debated what the future might look like in ten years from now. This was not planned beforehand, but it seemed like a natural way to end the session.

The whole interview was structured in a way so that it started very loosely with an overall discussion about domestic robots, making the participants aware of what the future probably might hold, to showing them how far we have already come. This was to really challenge them to think twice about their statements and their attitude as we moved along.

3.2.2 Findings

In the following the findings from the focus group will be presented. They will initially be presented in the same order as the interview itself was conducted. In the end however, the data has been sorted into five categories and submitted in Table 3.

Specific lines in the transcription (Appendix I) will be referred to in brackets after the sentence or section. All references and citations will be translated from Danish to English. Please refer to the appendix for the participants' original choice of words in their native language.

3.2.2.1 Thoughts about domestic robots

When asking what the participants thoughts about "robots for the home", JO and JA both say "The vacuum cleaner" immediately after (15). Also the lawnmower, The Jetsons[10], and an unspecified amount of sci-fi movies are mentioned (18-22).

After this, a debate about what exactly a robot is carried on.

[10] Futuristic cartoon series from 1962-1988 (IMDb 2014)

JO suggests that it has to do with whether you want to personify (*red*. anthropomorphize) the device and elaborates that his mother has a robot lawnmower, which she has named Roberta (14-45):

> *"I know that my mom has a robot lawnmower in her summerhouse that she calls Roberta. It is like it has a personality to her. Like a pet dog running around on the lawn barking."*

NI focuses mostly on that it has to be able to move around with a degree of artificial intelligence (*red.* mobile)(53-57):

> *"Isn't it more that it moves to do something predefined? That it is not stationary. It is not that a robot vacuum carries out a function much different from a water boiler, but it is moving around."*

JO and JU talk about that it is more a robot if it is able to do something on its own like start and stop (*red*. autonomous) (58-65).

Also JA and NI talk briefly about, that if someone had said "robot vacuum" 10 years ago people would probably have thought about a humanoid robot operating a regular vacuum (77-80).

3.2.2.2 Delimitation to ADMRs; Function and emotion

As noted earlier the delimitation to ADMRs is explained to the participants at this point. Then it is asked how an AMDR could be valuable to them followed by reading out the tasks found in "Sketching the future" (Sung, Grinter og Christensen 2008).

Function

First off the focus is on vacuuming, washing clothes and cleaning in general (116-121). Then the discussion falls on cooking, which the participants are having a hard time determining what they want.

JA, who has a husband and a child, seems relived by the though of someone cooking for her, while NI thinks it takes too much away from the home and he would like to eat food prepared by humans (128, 135, 141). JO agrees with NI and argues that it feels good and creates value to cook where cleaning on the other hand is dreary (136-137, 163-168).

Also TH adds that the home should not become a factory where everything runs automatically (143-147).

JA points out that people also get au pairs (154-156):

> "If you had a robot like an au pair that could help out a bit, and I didn't have to cook dinner after getter the little one. Arjh! (Like she would be relieved)"

TH stresses that a humanoid robot would not be preferable, as if she gets a bit eerie by the thought. She prefers for example the microwave to become smarter by making food out of nowhere (169-174).

Afterwards JU adds that we already have the bread-baking machine, but explains that it is not smart enough yet, as the bread sometimes does not get fully baked and there is a hole in it from the stirrer. She believes there would be the same annoying things with a cooking robot and finishes that an au pair would be smarter.

At this point TH is asked why it would be so much more different if the robot looked like a human to get some insights regarding The Uncanny Valley.

TH (193-195):

> *"I don't believe it. We will always think that humans are superb. Nothing can beat it. Robots should be aids for people."*

NI contributes (196-197):

> *"You want to be able to differentiate your self from it. The robot should be something else."*

Then JU comes up with a view that has not been found in the literature (198-209):

> *"I think it will remind us about our mortality. We have to die, but it can live on forever."*

NI adds that the robot you bought when you where 20 is just as good when you are 30 (210).

Finally JO suggests a robot that grows old with you and JU thinks it might be a good idea.

Emotion

From here the subject is changed to talking more about what kind of relationship you are going to have, or would like to have, with these robots in the future (219-221).

Ni firmly states (222):

> *" I'm never gonna have a relationship with one of these robots."*

Also he would never give it a name. But both JU and TH say they are going to love it just like you love you computer (223-226).

NI elaborates that he would use it solely as an aid, but he would love the function it performed (228-229, 231).

The conversation centers on the sci-fi movie "Her" from 2013, where the main character falls in love with his operating system, which has such a developed artificial intelligence that it seems human (IMDb 2014).

After this JU points out that this is what everyone is afraid of. You have to be able to turn them off, and TH adds that it is best if it stays in one operating mode. Then you feel safe and you are sure of what it is able to do (269-273).

NI wants to know whether he was the only one who did not like to personify things. JO does not give names to things as well he claims, but he has many things he loves as well (278-289).

JU widens the conversation by telling about her recent switch to a mac-computer from her old PC laptop. The old laptop had many faults, which kind of gave it a personality. Also they endured many accidents together that made it feel like they had a bond. The new Mac is just a computer because it just works. (291-298).

And JO adds (299-302):

"It is the same with people. It is the faults that is personality…"

To this it is asked whether it is a question about how lively it is before you will start to personify it and NI agrees with JU that you feel more connected to a device when it has a history of accidents you have endured together.

JU jumps back to the robot vacuum cleaner (315-316):

"Don't you think that you automatically would think; 'It is so stupid. Now it is stuck again'?"

TH (317):

"I don't think I would have patience for such a stupid vacuum cleaner."

It is asked whether you have not already devoted it some kind of intelligence just by using the word "Stupid" and NI agrees that you must have a conception about it being less intelligent than expected by calling it stupid.

3.2.2.3 Sci-fi video clips (The Fifth Element and Äkta Maniskor)

After this the first clip from The Fifth Element is played. JO notes that the robot vacuum cleaners today are just about the same (348-350).

JU states (351-352):

"It's funny, I wouldn't run it when I was at home and in front of my friends."

They discuss whether they would like a robot like this or the robot vacuum cleaner. JU feels it would be too high-tech for her apartment. Maybe if she could get a version that looked retro so it matched the style of her home (369-375, 388-389).

The more extreme clip from Äkta Maniskor is then played.

Everyone agrees that it would be too weird. NI says it is too personal and feels weird about having to decide the looks of it (409-410, 413-414).

TH (411, 415):

"It can get too perfect everything. We don't like that… We don't like competition."

JU (416):

"It plays with our instincts. About being young and beautiful."

A general eeriness among the participants was quite obvious, which of course also is what the filmmakers are trying to achieve. JO, however, states that you will never know what the trends are in the future, as we have things now we had not thought we would have 10 or 20 years ago (419-422).

Further the participants do not see this as a realistic picture of the future. NI thinks the robots will have more "robotic" looks (426), though JO argues that a humanoid design would be one way to make it fit into the style of the home referring to JU's concerns about this (433-436).

TH brings up that the looks of a robot should reflect its function (439-441).

JU also points out they had "dead eyes".

In the series the robots are intentionally portrayed as eerie as possible. So the conversation is diverted a bit away from this to talk about whether a humanoid robot in general could be useful or whether it has to reflect its function (454-457).

JU thinks they only would be useful for triggering instincts as sex toys (458-459):

NI continues that subcultures probably would arise with people having relationships to these robots like some people have now with the "Real Dolls"[11] (468-471).

The movie "Her" is brought up again and JO and JU talk about that the main character is able to fall in love with the "robot" because it can reflect back on his situation and feelings (472-480).

After this the conversation turns to talking about slaves. JU states that we have always had slaves and many of the greatest achievements in our history could not

[11] Human-sized sex dolls that resemble humans in every possible way.

have happened without slaves. Robots will probably not help us get more time on our hands, but help us achieve more things (494-505).

Eventually the talk falls on that humanoids might after all be valuable for working with old people so they feel more comfortable. JU additionally points out that there could arise some problems if robots looked like people and you could treat them badly because they were just robots (533-534, 542-544).

3.2.2.4 Promotional video (Neato BotVac)

After the clip, promoting the rather new addition to the robot vacuum cleaner product range: the Neato BotVac, JU states that it was cute and JA is surprised that you are able to buy something like that today (553-554). Also they do not think it is creepy.

JO notices that they were portraying it as being part of the house; that it fitted in somehow (568-571).

JU (572):

> *"Don't you think the dogs will bite it?"*

Also JA is concerned that you would need a very uncluttered home for it to work probably (573-574).

Most of the participants would like a device like that at home. However TH says it would be very ugly to have one of those standing around at home. She would rather prefer the ones from The Fifth Element that disappeared into the wall when they were done.

However she considers it could "live" under her bed (589-590).

Finally NI was surprised that it was able to handle rugs on the floor and doorsteps (607-608).

3.2.2.5 The world in 10 years

It is then asked what they think the world will look like in 10-20 years – whether it has been taken over by robots in some aspect.

NI thinks everyone has a robot vacuum cleaner, as you could get one for 499 DKK in Netto (613-614).

TH, however, is afraid that people would think she was lazy if she had one of those (617-618). JU adds that the robots you have will be a question about fashion and signals you are sending (619).

NI points out that people probably once thought you were lazy if you had a dishwasher (623-626).

TH (627-629):

> *"But it is all about to which degree. Because someday we can just lie in our beds and do nothing and the robots will do everything for us. That we don't want."*
>
> *"I think the limit is that people has to be in control. When something else is controlling the boarder has been crossed."*

NI argues that 10 years ago people would not have liked the thought of the metro running without drivers in the trains. And in 20 years the cars will drive them selves even though we do not like that now.

Also JU adds that you want to grow tomato plants in your window yourself, but it is ok to have a robot vacuum cleaner because that is boring. It has to do with where you put your identity, she points out. (642-646):

NI (647-649):

> *"Yes it can reheat the lasagna in the oven, but the expensive steaks I want to fry myself."*

Below the findings are sorted into four categories in the same way as "Sketching the future": Form, Functionality, Emotional bonds and Concerns. This is to facilitate the further analysis. However a fifth category, Miscellaneous, has been added to accompany findings of a more broader character.

Table 3 - Finding from the focus group

Form	Functionality	Sociability	Concerns

- Has to fit the style of the home. One thought the Neato was ugly. - Form should reflect function. - Has to look robotic/machine-like. Why not a humanoid? - Nothing can beat us - Should be something else - Reminds us about our vulnerability - Too perfect - Don't like competition - Plays with your instinct - Young and beautiful - Too personal - Dead eyes	- Light cooking - Cleaning - Washing clothes - Drive your car - Do the boring things - Not the things that identify you. - Humanoid could be used as sex toys in sub-cultures or to care for old people. - Slaves could help us achieve great things like in the past, but will probably not provide us with "more time" on our hands.	- One claims he would never get an emotional bond to a robot. - Two girls would love it like they love their computer. - Faults and imperfections can establish bonds and attribute personality to a machine/robot. - A robot most be able to reflect back on a persons feelings and situation to make an emotional connection.	- Would not run it at home when friends are there. - Afraid you would be regarded as lazy with a robot vacuum. - We don't want to lie in our beds and do nothing. - People have to be in control. On/off switch. - Abusing robots could give rise to problems.

Miscellaneous
- It has to move to be a robot. *- It has to be autonomous to be a robot.* *- The participants were aware of the robot vacuum before hand.* *- Today we view robots as a lot more than "just" a mechanical humanoid device.* *- Whether you have one would be a question about fashion. Signals you want to send might change.* *- In 10 years everyone has a robot vacuum cleaner.* There are multiple cases throughout the interview where the participants are using anthropo-/zoomorphic terms about the robots in discussion: - Neato BotVac was described as "cute". - The robot vacuum cleaner could "live" under the bed. - No patience for such a stupid vacuum. - JO's mom had given her robot lawnmower a name and liked the fact that it was "running around" on the lawn.

3.2.3 Method criticism

When looking back on your decisions usually there are things you could have done differently or better to maybe get better results. These are laid out here.

Having participants that know each other prior to the interview have, as pointed out above, some advantages, but also some disadvantages.

The most prominent one is that the discussion could take a frivolous character and a lot easier get off track with jokes and personal talk once in a while. Also it could be that the dynamics of the group of friends might actually be that some would close up more than if everyone else were strangers.

More diversity in age and education could also have produced some interesting additions to the findings. This was down prioritized in the recruitment process, as it was more important to find people that had imagination for this kind of topic.

One problem with the focus group was that you rarely got a person's opinion completely uncovered, as other participants usually came in and took over after each statement or even interrupted the person speaking. Often the conversation gets deeper because of this, but in other situations it can also get a bit shallow.

This is where the in depth interviews in the next section will contribute well.

Also when transcribing the recording, some of the questions that were asked during the interview were a bit misleading due to lack of experience.

Furthermore, it is important to note that when using a deductive approach to collect qualitative data, the findings extracted from the literature can make your analysis of your primary data somewhat biased. It is difficult to keep a completely open mind if you are looking for something specific in the data (Saunders 2012).

Finally it was discovered after the interview that iRobot had a promotional video for the Roomba that would have been interesting to show additionally to the Neato video, as it focuses more on technical attributes than the personality of the robot.

3.3 In depth interviews

To gain a deeper understanding of what end-users want from future ADMRs, and what drives them to make this choice, a number of in depth interviews were performed. Each respondent produced a drawing and two value chains from the interview. This will be elaborated on in the next section.

The drawings contributes nicely to the findings from "Sketching the future" reviewed in 3.1. Here the respondents drew robots in a focus group setting and afterwards discussed what they had made. Some personal values for having a robot at home were briefly mentioned in the end of the article.

In this experiment the respondent were to draw a robot without the influence of others around them, and the personal values are very much in focus when conducting the interview.

This sits well with the focus group, as this was a more broad discussion. When conducting in depth interviews the respondents are not able to reflect on other

people's ideas and emotions and get interrupted, which will better reveal the individual participants' true motivation. This data can further be used directly in marketing, as we shall see in Managerial implications.

3.3.1 Methodology

The approach used for the interviews is a Means-end approach using "laddering" as the interviewing technique. This technique is very useful to uncover the real personal motives behind why people buy what they buy or want what they want. In other words, to understand what really drives people to make decisions (RockBridge 2013).

This enables you to make a marketing campaign that, not only focuses on the products' attributes and the basic benefits, but also aims at the consumers' emotional triggers.

The means-end approach is based on a theory that product and service attributes are associated with consequences, or product benefits and risks, and even the personal values the product can help consumers fulfill. The result is a value chain, or ladder, linking a product's attributes to its functional, psychosocial, or emotional consequence, to the underlying personal value (RockBridge 2013).

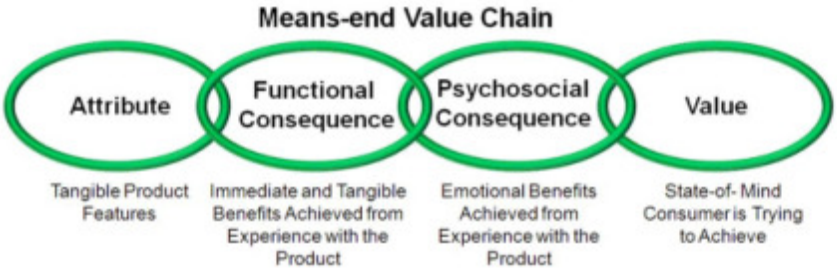


Figure 7 - Means-end value chain (RockBridge 2013)

To get to the personal value regarding a certain choice you have to dig deep using the laddering technique.

Simply put you have to keep asking something like "Why is that important to you?" or "What do you mean by that?" without frustrating the respondent, until you get to the end.

It is important to make the effort of making the respondent relax during the process, as the questions in the end are aimed at the person's personal views. Good rapport is needed for a successful interview. Underway the interviewer can explain that the questions might sound obvious or stupid and there is no right or wrong answer. This gives the respondent the feeling that the interviewer is just following protocol and is

not judging his or her ideas. Furthermore, it is important to remain neutral by avoiding leading questions and let the respondents find the answers themselves (Saaka, Sidon og Blake 2004).

The biggest challenge is when people get stuck at some level and just say something like "Well, just because I like it." To come about this you have to quickly think of a new way of phrasing the questions to move on (Saaka, Sidon og Blake 2004).

Since the next generation of ADMRs does not exit yet, the participants were asked to imagine, by drawing and explaining, a robot for their home. It had to be able to do something they appreciated and they should explain how it operated and how it was designed. Also it was explained that the robot should be autonomous and mobile to fit this thesis' delimitation. The exact formulation that the respondents were handed can be seen in Appendix IV.

The laddering technique was then employed on the basis of this drawing to find out what personal value they would get from having this robot.

One product and its attributes may reveal more than one observation per step or more ladders. These ladders can be used directly to make a statement for use in marketing, as we shall see later. When using this technique on one specific product you can compare the ladders in a hierarchical value map (HVM) to find the strongest connections (Saaka, Sidon og Blake 2004). However in this case where all the products are different, the findings will be analyzed more broadly to help construct hypothetical examples of how to market ADMRs in the future.

3.3.1.1 Drawings

Each respondent was asked to draw a robot they would like to have in their home. They were told it had to have at least one function or ability they appreciated. Also it should be mobile and present in the home.

Besides serving as a starting point for the interview, the drawings and descriptions serve also as a dataset in them selves, which also will be used in answering the sub question. These provide a great insight into what people want from robots as an extension to the findings from "Sketching the Future".

3.3.1.2 The interviews

Five in-depth interviews were conducted on the phone lasting 15-20 minutes. Notes were taken, filling out the rings in the value chain, while performing the interviews and it was also recorded on the computer if it was necessary to go back and listen to some of the answers.

The interview was divided into two sections:

1) Functional value
2) Aesthetical value

In section one the focus was on what value was gained from the robot's function and the first question was "What is the primary reason you want this robot?" The second section focused on what was gained from the design and appearance of the robot. Here the first question was "Why did you choose this exact design?"

When the probing was done and the ladder was complete at the end of each section, the answers were read out loud to the respondents giving them a chance to add even more.

Gitte

54 years old, bookkeeper, owns a house with her husband.

Ken

31 years old, business student, rents an apartment with his wife, and has a 2-year-old son.

Niels

25 years old, student, rents an apartment with his girlfriend.

Signe

32 years old, writing Ph.D, owns apartment with husband, is pregnant.

Jonas

28 years old, project leader, owns his apartment, has a roommate, and single.

The group was attempted to be as heterogeneous as possible regarding age and gender, as the personal values for old and young, and male and female, probably would differ a lot.

3.3.2 Findings

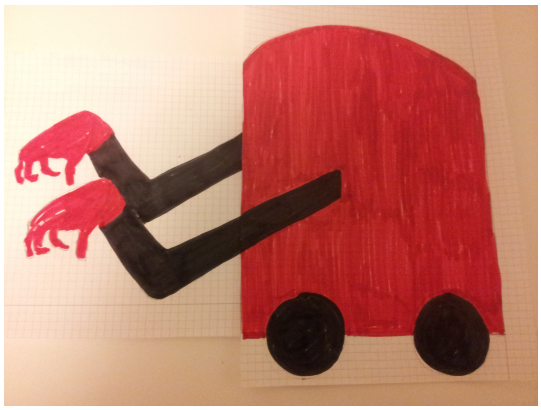
In the following the drawings of the robots and a summery of their functions and design will be presented followed by the ladders from the means-end approach.

3.3.2.1 Drawings and descriptions

See full description of the robots in Appendix V as the respondents presented them.

Gitte, 54 – Massage robot

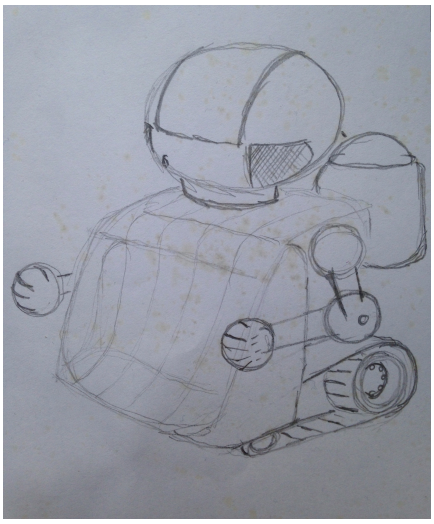
- Arms and hand in full human size.
- Hands feel exactly like real hands.
- Able to massage in many different modes.
- Voice controlled.
- Hands and arms go inside the body when turned off.
- Red and black.
- 35 cm wide and 50 cm high.
- Looks nice in the corner of the living room.



Picture 14 - Massage robot drawn by Gitte, 54.

Ken, 31 – Home assist robot

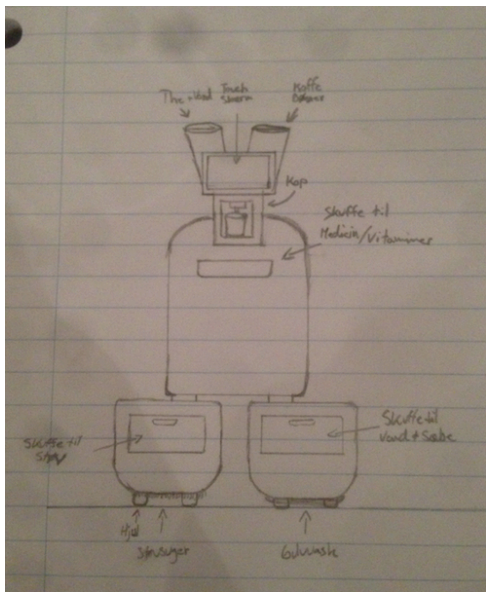
- Help with cleaning.
- Does boring things.
- Help with power savings.
- Touch screen.
- Voice controlled.
- Small design.
- Childlike look.
- Unintimidating.



Picture 15 - Home assist robot drawn by Ken, 31.

Niels, 25 – Robot helper

- Help with everyday chores.
- Vacuuming and mopping.
- Synchronized with iCal.
- Turn on radio/morning TV and light in the morning.
- Make morning coffee and prepare vitamins.
- Touch screen interface.
- Non-dominent presence.



Picture 16 - Robot Helper drawn by Niels, 25.

- Neutral design. White/grey plastic.
- 1 meter tall.

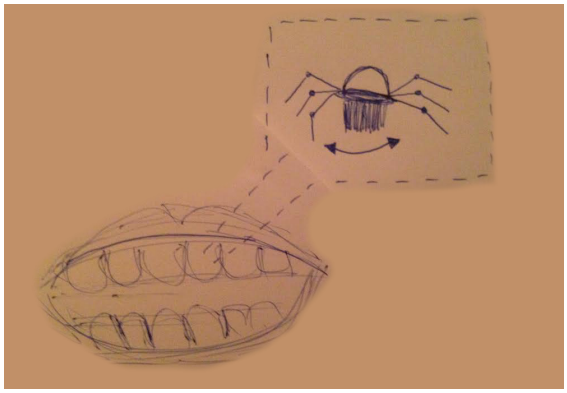
Signe, 31 – Robot pet

- Cuddly.
- Does not make a mess.
- Able to learn tricks.
- Does not have to be fed or go to the toilet.
- Has its own personality.
- Small and cute.
- Looks and feels like a real animal.

Picture 17 - Robot pet by Signe, 31.

Jonas, 28 – Mouth washer

- Able to clean teeth unnoticed.
- Can get to every corners of the mouth.
- Can clean anytime anywhere.
- Lives inside mouth behind a tooth.
- Something between a spider and a tooth brush.
- Nano-sized.



Picture 18 - Mouth washer drawn by Jonas, 28.

3.3.2.2 Means-end results

In the following the ladders, or value chains, will use the letters A-FC-PC-V as Attribute – Functional Consequence – Psychological Consequence – Value, to create the ladder. The ladders are read from the bottom to the top from (A) to (V).

The notes from the interviews, which these are derived from, can be found in Appendix VI.

Gitte, 54 – massage robot

Interestingly this robot was in the end a solution to avoid conflicts in the house. When you are married you always have a pair of hands to massage you, in theory,

but this might not always work out. This respondent often played tennis and was in need of frequent massages to not get headaches from infiltrations. Her husband was able to do this, but she did not like to ask him too often.

This woman also wanted the robot to be very visible in the living room. She thought it had a nice cheeky design and thought it would remind her of something good as it stood in the corner. In the end giving her a sense of wellbeing.

Functional value:

(V) Avoid conflicts

(PC) Do not want to feel bad about asking him

(PC) Do not waste time discussing

(PC) Do not have to ask husband for massage

(FC) Get rid of infiltrations leading to headache from playing tennis

(FC) Get massage everyday

(A) Many massage modes

(A) Hands with human size and feel

Aesthetical value:

(V) Gives you a feeling of wellbeing

(PC) It reminds you of something good

(PC) It is nice to have around

(PC) It reminds you to get a massage

(FC) Looks nice in the corner of the living room

(FC) Nice cheeky colors

(A) Red and black, small

Ken, 31 – Home assist robot

This respondent wanted a robot to do all the bothersome things around the house. Pretty quickly it came to the surface that this would allow him to spend more time working on himself and being with his family. This in turn making him a happier person to be around, getting to know his family better and realize himself on a philosophical level.

He also wanted the robot to be very small and cute. First of all so it would not scare his two-year-old child, but also so it would better fit in with his family. He felt a big responsibility for his family and the robot should be under his protection the same way as the other members.

Functional value:

(V) Realize yourself

(V) Get to know the family even better

(V) Become a happier person to be around

(PC) More time to develop yourself

(PC) More time to be with family

(FC) Relieve one self of the burden of housework

(A) Energy savings

(A) Cleaning

Aesthetical value:

(V) Protector of the family

(PC) Responsible for the family

(FC) Part of the family

(FC) Non-threatening

(FC) Cute

(A) Small childlike appearance

Niels, 25 – Robot helper

This robot was very similar to the former and the means-end chain resembled it as well. To begin, the robot should do all the boring things around the house, making sure everything was ready in the morning, and managing the schedule. This was in turn to get more time to be with the family and earn more money, which lead to more experiences and in the end more quality of life.

Contrary to the former case, this robot should not be a part of the family. He wanted it to be like a fly on the wall - anonymous and unintimidating. It made him very unease to think of the robot as a social product. His home was only meant for him and his family.

Functional value:

(V) Quality of life

(PC) More time to earn more money

(PC) More time to be with friends and family

(FC) Get rid of boring thing you do not want to do

(FC) Comfort

(A) Scheduling

(A) Help with morning routine

(A) Cleaning

Aesthetical value:

(V) Gives a feeling of ease

(PC) Do not want to be disturbed in the private sphere

(FC) Non-intimidating

(FC) Anonymous

(A) White or grey plastic

(A) 1 meter tall

Signe, 32 – Robot pet

This respondent loved animals, but thought they should live in the wild where they belong. However she would love to have a robot pet that did not belong anywhere else.

To start, she thought it could be a fun kind of entertainment as opposed to watching television. This further made her feel like she would be more present in reality and thereby get more quality in life.

She put a lot of emphasis on it being 100% lifelike so it actually looked and behaved like a real animal. Just with none of the annoying things from a real pet, like cleaning up after it and feeding it. If this was possible some day she could see it as a companion to some degree and would eventually help her not feel alone in her apartment.

Since the robot should be 100% lifelike she thought it would be just as good to use a picture of a tiger as drawing one.

Functional value:

(V) More quality in life

(PC) Be more present in life

(PC) Be active instead of watching television

(FC) Active entertainment

(FC) Fun

(A) Own personality

(A) Cuddly

(A) Can learn tricks

Aesthetical value:

(V) So I do not feel alone in the apartment

(PC) Companionship

(PC) Contribute with real life and activity

(FC) Looks cute

(FC) Feels nice to touch it

(A) 100% life like

(A) Small

Jonas, 28 – Mouth washer

This respondent wanted a robot to automatically and unnoticeable clean his teeth, as he found this very boring. However he really wanted clean and healthy teeth to be liked and accepted by other people.

It should be designed very small and spider-like so it could function unnoticed in his mouth. This was so he did not have to waste time and worry about brushing his teeth ever again, and could instead use the time on more valuable things.

Functional value:

(V) So people do not get repulsed by me

(PC) Good breathe

(PC) Healthy teeth

(FC) You never forget

(FC) You do not have to brush you teeth yourself

(A) Brush teeth better than with a toothbrush

(A) Brush teeth automatically

Aesthetical value:

(V) Spend time on more valuable things

(PC) Save time

(PC) Do not have to worry about your teeth

(PC) Focus on other things

(FC) Unnoticeable in the mouth

(FC) Lives in the mouth behind a tooth

(A) Looks like a spider

(A) Nano-sized

3.3.3 Method criticism

For en inexperienced interviewer, the laddering technique is a difficult way of interviewing because the respondent quickly may start to wonder where you are going with the questions. This can have you get the feeling that you at some point are starting to annoy the interviewee, and some of the interviews could have lost some thoroughness on this behalf.

The group could have been more heterogeneous, but the assignment was quite comprehensive and it proved difficult for some people to finish the drawings. As people dropped out it was necessary to find replacements immediately and some did not contribute too well to the diversity of age. Also some of the participants wound up being the same as from the focus group due to this. It would have been preferred to use new ones for these interviews.

As a rule of thumb a minimum of 20 laddering interviews are needed to gain true insight into the drivers behind buying or choosing a certain product (RockBridge 2013). In this case, five interviews are gathered to say something about the next generation of ADMRs, and these are all based on different kinds of imagined ADMRs. This will be fine to make overall assumptions about future drivers for wanting an ADMR at home, but for one specific ADMR to be marketed, more interviews need to be made. This is to be able to make and analyze a hierarchical value map, to uncover the strongest links between this specific product's attributes and the end-users' personal values for buying one.

The Mouth Washer is mobile and autonomous, but whether it is domestic is a topic for discussion. The results will be used on par with the other robots even though it is a bit outside of the delimitation.

3.4 Sub conclusion

Here the findings from the eight key articles, studying the interaction with the Roomba concerning sub question 1, have been presented systematically. Further the article “Sketching the future”, the focus group and the in depth interviews, concerning sub question 2, have been laid out. Next it is necessary to find out how these together contribute to an understanding of the bigger picture, or how they might contradict each other.

4 Analysis of the sub questions

In this section the findings from all the articles, the focus group and the interviews will be analyzed to make it clear what has been discovered. Afterwards these findings will be looked upon and discussed from a social psychology angle. Ultimately the sub questions will be answered.

4.1 Sub question 1

When looking at the findings from the articles it is obvious that there are some commonalities and differences. In Figure 8 below they are divided into three main categories; Anthropo-/Zoomorphism, Mediator and Roombarization with their respective sub-categories. The bubbles in red are findings from the succeeding European articles that to some degree question or add to the conclusions from the first studies.

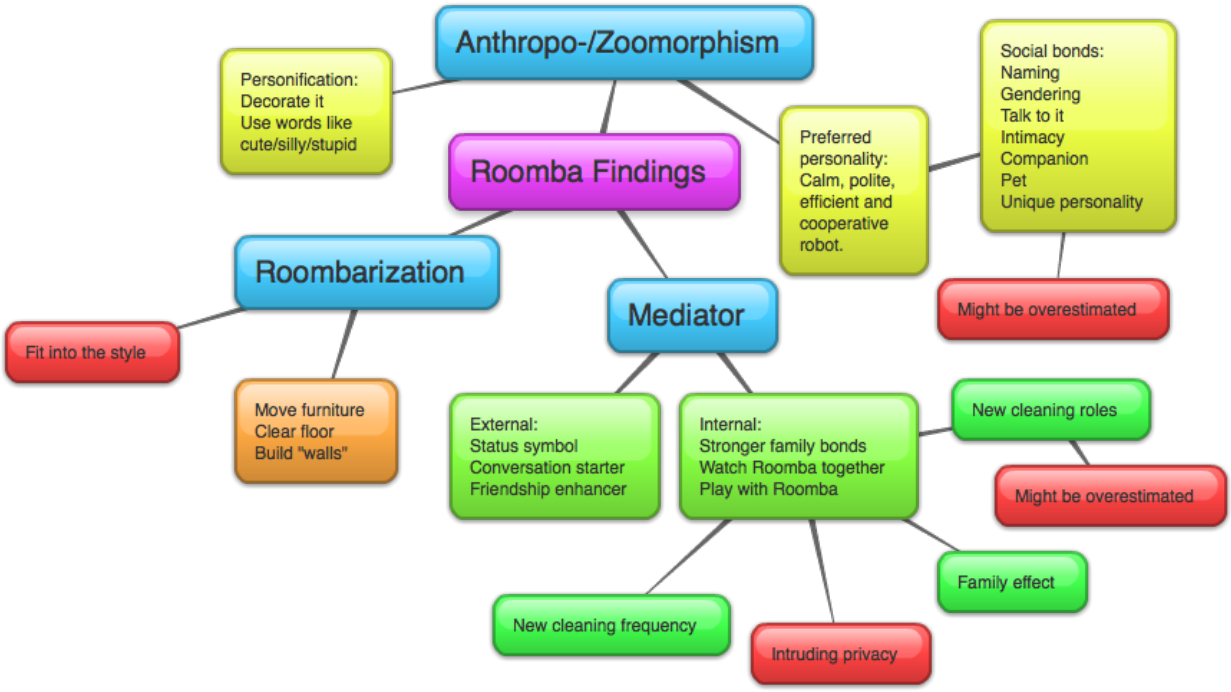


Figure 8 - Categories of findings in the articles

Regarding the Anthropo-/Zoomorphism category it is divided into two sub-categories, “Personification” and “Preferred personality”, with the more extreme “Social bonds” under this. The step before actually developing emotional bonds is when people are able to express what kind of personality they prefer. The study “Vacuum cleaner personality and behavior” (Hendriks, et al. 2010) shows that people are able to see the lifelike attributes in the vacuum and recognize the encoded personality. It does however not necessary mean everyone will develop an emotional bond.

The first articles put a lot of emphasis on these social bonds that seem to develop. This might however be overestimated a bit (Fink, Bauwens, et al. 2013). This could be due to the novelty of the product at the time these studies were conducted or the choice of participants. The authors could have been slightly over enthusiastic about their finding. However, there definitely is a handful of the more extreme cases where some people had given it a name, a gender and had some kind of relationship with the robot as a companion, or pet with its own personality, that is worth taking into account.

Also, as the robots become more life-like and communicative in the future this tendency might be more widespread among the consumers.

Roombarization was observed in both the early and later articles. This makes good sense, as it in most households is necessary for the robot to work properly, which consumers presumably are interested in. Opposed to changing the physical environment in the household, it was found that it should fit into the style of the home (Fink, Bauwens, et al. 2013). It probably depends on who you ask, to what degree this is important. Some do inevitably care more about design than others, but nonetheless it is important to note; and everyone cares at least a little bit.

The mediator category also is divided into two groups: How it would mediate relationships internally in the household and externally with people from the outside.

Externally the vacuum could serve as a status symbol if you wanted to communicate that you had a technologically advanced household. It could also be a conversation starter when guests came over to visit, and enhance friendships by borrowing it out e.g. (Sung, Grinter og Christensen 2010). New technology always brings out curiosity in people it seems, but somehow it seems that the autonomous and mobile nature of the vacuum spawns an extra layer of curiosity.

Internally it was recorded multiple times that it could mediate stronger family bonds by playing with the Roomba, watching it work or help it get around. This makes good sense if it means spending more time together as a family. Further it could change cleaning frequency and cleaning roles. According to the qualitative part of the data from “Living with a vacuum cleaner robot” (Fink, Bauwens, et al. 2013), changing cleaning roles could however be overestimated. Also the same article found that some participants felt the robot was intruding on their privacy if they used it while they were home, possibly making its mediating role not purely positive. As the product was much newer and interesting in the first studies, this probably had an impact on the reception of the vacuum, and the dynamics in the family changed more radically. With the product being on market six more years before the last study, one could argue that people are more informed about what it does, and how it does it, thus making it less interesting; ultimately it just vacuums the floor. Also

different household dynamics will probably have a great deal to say about how these products will mediate change.

However, it seems that members of a family will in most cases influence each other and share a common opinion towards the robot (Fink, Bauwens, et al. 2011).

The findings from the first five articles are definitely worth noticing and provide an exciting insight to this new field. Marketing has to adjust and learn to take advantage of these trends it seems.

It is difficult to say to what degree this holds true and to what degree it will change when newer and different ADMRs enter the market. The next section provides insight to this.

4.2 Sub question 2

In this section the findings from "Sketching the future" and the focus group are looked at together where the in depth interviews builds on top of this afterwards. In the end the apparent social nature of ADMRs are discussed in "The social product" section.

4.2.1 "Sketching the future" and the focus group

The findings from the focus group in "Sketching the future" (Sung, Grinter og Christensen 2009) and the focus group conducted for this thesis, were divided into the same four categories to be able to better look at them conjointly. This is illustrated in Figure 9 below.

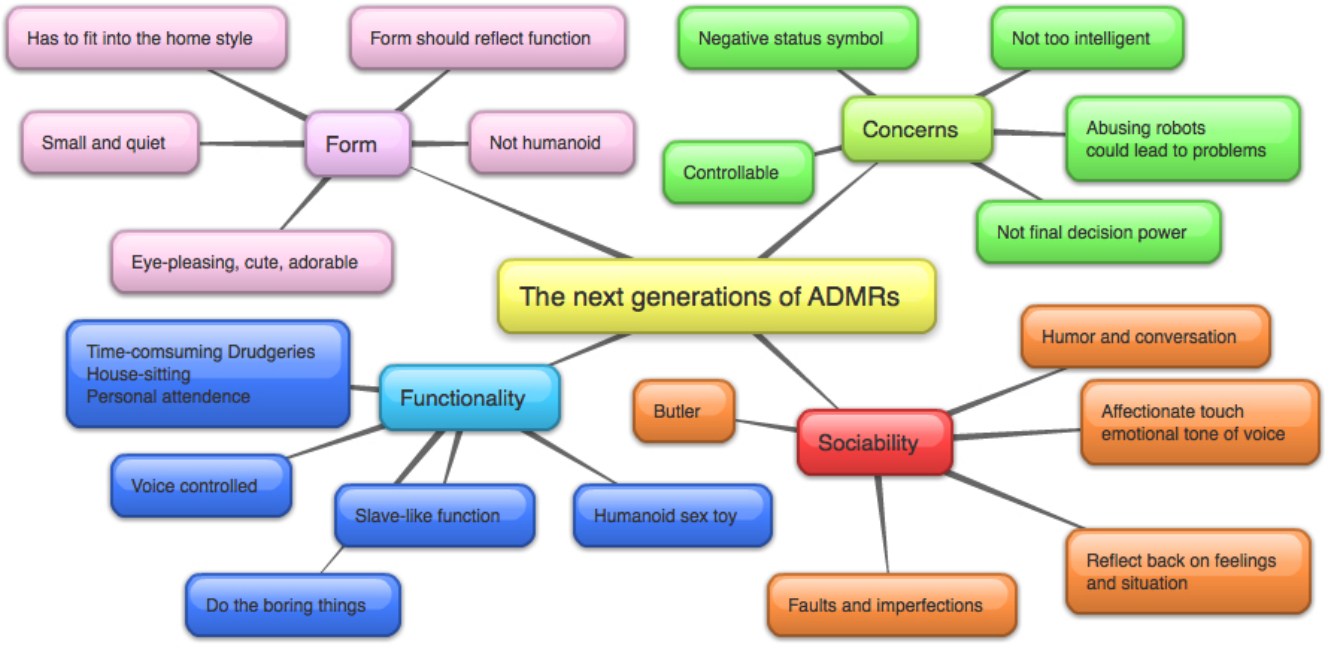


Figure 9 - Findings from the focus group and "Sketching the future"

When people are imagining having a robot to help out in their home in the future, it seems there are four main areas that are in focus: Form, Functionality, Sociability and Concerns.

Contrary to the many science fiction movies and series[12] depicting humanoid robots in our homes, this form was not preferred in either case. It was on the other hand proposed that it should reflect function, but still be pleasing to the eye. It should fit into the style of the home, not disturb with noise and take up too much space. In the focus group the humanoid form seemed to creep out the participants and it got too personal apparently. The Uncanny Valley definitely was noticeable in this case.

The functionality was the main focus of "Sketching the future" where, as noted earlier, 99 different tasks were found within Time-consuming drudgeries, House-sitting and personal attendance (See Appendix III). Time-consuming drudgeries were the most prominent category and this seemed to be confirmed with the focus group for this thesis where the talk was mostly on cleaning and cooking. These tasks were classified as the "boring things". It was also mentioned that the robot should do slave-like things, it should be voice controlled, and finally some groups of people would probably use a humanoid robot as a sex toy.

The sociability of the robot was important as well. In "Sketching the future" A butler-like presence seemed to be preferred the most. It should be highly socially calibrated and even posses humor, conversation skills, and affectionate touch and tone of voice. This was expanded on in the focus group for this thesis where it was stated that if you were to have an emotional bond with some entity, it should be able to reflect back on your situation and feelings. Also, if some mechanical device should be seen as truly lifelike, and you should be able to develop a real emotional connection, it should have faults and imperfections "pre-coded". In other words it should resemble our selves more so we can be able to relate to it.

Multiple things seem to concern people about having a robot in their home. First of all, it is concerning if the robot could get out of control and make final dangerous decisions on its own. Many worst-case scenarios of what potentially could happen have been portrayed in various science fiction movies, and the participants seemed to be influenced by this. Also it was noted that it should not be too smart when helping out. People would want to be incorporated in the process as well for the sake of their own development of various skills. It seems no one wants to just lie on his or her back and have the robot do everything. Also, some thought that some tasks, that apparently were enjoyable to do, like frying expensive steaks, were not tasks for a robot.

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[12] E.g. A.I (Steven Spielberg 2001), iRobot (Alex Proyas 2004), Alien series (Sigourney Weaver), Surrogates (Bruce Willis 2009) and Äkta Maniskor (2012)

Additionally to what has been reported generally in the articles, the focus group for this thesis talked about how having a robot might send a signal that you are lazy. It was discussed that it was a question about fashion, but it could have a negative symbolic value.

The signals you send have always been important for people, maybe even more so with robotic products, as they are more likely to be able to make big changes in our lives.

4.2.2 In depth interviews

The drawings confirm some of the findings from "Sketching the future". The Home Assist Robot and the Robot Helper would belong to the time-consuming drudgeries category. The Massage Robot and the Robot Pet would belong to personal attendance and the Mouth Washer to house-sitting.

Building on top of the findings from the focus group in "Sketching the future" and the focus group for this thesis, the in depth interviews reveal multiple personal gains or values from having an ADMR.

The steps in focus are the psychological consequences (PC) and values (V) from the ladders in the functional value part of the interviews.

The most prominent psychological consequence was that an ADMR was perceived as a time saver, or rather as a product that could free up more time for more important things. All the respondents mention this in some way and this is what we get from "Sketching the future" as well.

This, in turn, leads to a number of underlying motives or values that can be summed up to "Realize your self" and " More quality in life". It is fair to say that these two topics are of the biggest concern in the developed part of the world at the moment, and has been for a while. Robots are naturally perceived as a mediator for this, as they will be able to relieve us from many tasks hindering this.

Regarding other kinds of personal value gains the massage robot was actually meant to stop a minor conflict in the social arena of the home between the man and the wife. It seems robots might be expected to be a part of the social arena, not just become it by chance in the future.

Two of the robots were also meant to strengthen a sense of belonging with the society as with the Mouth washer and the Robot pet. The respondent with the Mouth washer eventually wanted this product to feel accepted with good dental hygiene and the Robot Pet could mediate not feeling sad and alone in the apartment.

Robot companions of all forms in the future may have a huge impact on the society, as we know it. Just like we are attached to our phone all the time and forgetting

about the people just next to us, we might someday get our need for social interaction covered somewhat by our robot companions instead of venturing out to meet real people.

4.3 The social product

One author argues that the domestic socialization of robots is largely dependent upon subjective consumer perceptions of what robots are, how they work and what exactly they are, and are not, capable of doing in a domestic environment (Young, et al. 2008). This was also very observable from the focus group for this thesis. In other words for optimal adoption the robot has to fit uniquely into the norms and attitudes of every home. You could say it is like finding a new roommate to share your apartment. It is not enough that it is a just human being if he or she is going to move around in the same personal space as you.

The robot has to have a "personality" that every individual owner can relate to or at least accept in his or her home.

Also we have seen that customizability is key with almost every technological product in recent years (Olins 2014). Robots will probably inherit the epitome of this.

To solve this problem we need to understand the social dynamics when accepting and adopting a robot in the home.

The Domestic Robot Ecology (DRE) tells us that there are multiple steps in the adoption process, and how the robot will function as a social product in our homes. We will interact with it and it will interact with us on a deeper level, than what so far has been observed with technological products. It is therefor interesting to take a look at what the social psychology has to say about this.

In "Towards acceptable domestic robots" Young et. al 2008 outline a perspective on this. They apply the concepts of four different social models concerned with the adoption of new technology, in order to highlight many of the specific social factors that are likely to affect the adoption process for domestic robots. None of these models can explain the unique nature of robotics on their own, but put together, the authors are able to produce seven factors affecting the acceptance. Also they present four factors that represent the perception of these factors, which is at least as meaningful as the factors themselves (Young, et al. 2008).

The frameworks they use, to yield the factors below, are the Theory of Reasoned Action (TRA)[13], the Theory of Planned Behavior (TPB)[14], the Technology Acceptance Model (TAM)[15], and the Model of Acceptance of Technology in Households (MATH)[16].

Factors affecting the acceptance of domestic robots:

- ***Safety concerns:*** Robots are potentially more dangerous than any other product for the home we have seen.
- ***Accessibility and usability:*** The capabilities and complexity of robots raises serious accessibility concerns.
- ***Practical benefits:*** Potential positive impact on quality of life.
- ***Fun:*** Both fun with the robot and more leisure time for fun.
- ***Social pressures:*** is it modern to have a robot or are you lazy?
- ***Status gains:*** Robots could provide some prestige to you social status.
- ***Social intelligence:*** You are more prone to accept a robot that you can communicate with and anthropomorphize.

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[13] This model assumes that rather than being controlled by capricious sub-conscious forces, people are generally rational and leverage information available to them (Ajzen and Fishbein 1980).

[14] This model, an extension to TRA, adds an explicit focus on perceived behavioral control and points more to external factors (media, social acceptance, etc.) than to "previous experience" in the TRA model (Mathieson 1991).

[15] In this model perceived usefulness and perceived ease of use define the attitude of a single person towards the products (Davis 1986). However, no social factors are taken into account.

[16] This model identifies that, in comparison to other contexts, household decisions have a more normative structure and are highly affected by social pressures, views of relevant others, and media (Venkatesh and Brown 2001). It takes a more outside-in look at the household and thereby does not take social dynamics between the robot and the human into account.

The Perception of Factors Affecting Acceptance:

- ***Previous experience:*** The biggest influence on how you would perceive a robot.
- ***Media:*** As not many products exist many opinions about robots will probably stem from what the media presents. Also Sci-fi movies.
- ***Personal social network:*** The opinions of your closest will affect your opinion as well.
- ***Design of the robot:*** Directly triggers previous experiences that determine how we feel about the robot.

As we can see these factors affecting acceptance, corresponds nicely to the findings above, where just about all of them where brought up. Also, how we perceive these factors via previous experience, media, personal social network and robot design was in discussion many times in the focus group.

The big difference between ADMRs and other products for the home, due to their autonomy and mobility, is that they have to be included in the social sphere of the household to achieve the much desired personal gains, but at the same time spawning a whole new array of challenges. One view is that we will perceive ADMRs as a whole new kind of entity that has to fit into the social ecosystem of the home (Young, et al. 2008) (Sung, Grinter og Christensen 2010).

Grounded in all the evidence that has been put forth in the preceding sections and with the arguments of Young et al. 2008, the answer to sub question 2 is that we most likely will come across totally new challenges with the coming generations of ADMRs than we have encountered before. We will interact differently with these robots compared to other products, as they will enter the social arena of the household in whole new ways due to their autonomy and mobility. How we will accept and adopt these new entities, however, is difficult to say as they will probably vary a lot in form and ability, but the preliminary research gives us an idea that is worth taking into account when developing and marketing the next iterations.

4.4 Sub conclusion

In this section the evidence has been made clear that we perceive and interact with the ADMRs of today (the robot vacuum cleaner) in a seemingly unique way. The most important discovery is that some people seem to anthropomorphize or zoomorphize the ADMR and even develop an emotional bond. This phenomenon might be more or less prominent in the future. Also the robot vacuum cleaner induced physical changes to the home called Rombarization.

When people are asked to imagine robots they want in their homes, many possibilities come to the surface. Most people seem to want a robot to take care of the boring things at home or the things they cannot do themselves. Ultimately to get

more time to do the important things like being with your family, develop themselves or get more experiences and quality in life. However there are also limitations to what people want from robots. For example some people do not want robots to take care of cooking, as performing this task can have some personal value.

To achieve the benefits of having a robot, the robots do however have to become social products. This raises a number of concerns about how it can be controlled, what symbolic value it will elicit, how it should behave and how it will enable us rather than just make us obsolete.

For people to accept robots in our home these concerns have to be dealt with in development, but also when marketing the products, which will be discussed in the following.

5 Managerial implications

In the preceding sections the two sub questions has been answered with the help of numerous findings from the literature, the focus group and the in depth interviews. Now all this will be looked at from a marketing angle to suggest how ADMRs should be designed and marketed now and in the near future to accommodate the special nature these products posses, hereby answering the research question:

> ***How to design and market the next generations of Autonomous Domestic Mobile Robots?***

5.1 Demands and possibilities

As stated in the introduction, the robot revolution brings many business opportunities. With a potential market size of personal robots of more than 50 billion dollars worldwide in 2025 (Gates 2007), this could soon be an interesting business to be in. The biggest demand in domestic robots seems to lie in robots that do all the "boring things" around the house (i.e. Time-consuming drudgeries). But also robots for House-sitting or personal attendance, as described in Appendix III, could create big markets with the right products.

5.2 Design and The Uncanny Valley

The Uncanny Valley has to be central in the discussion about how the design of an AMDR should be. The framework is unfortunately not very conclusive in what exactly to do. It seems the design has to balance between not being too much "just a machine" and thereby not bring out any emotions in the consumers, and not too alive or human for our minds to get confused by what it is and feel eerie.

As stated in "How robotic products become social products" (Forlizzi 2007) simple social attributes, like gaze, negotiation, motion or speech incorporated into the design of the robots, could have people adopt ADMRs even faster. But what is the right amount of social attributes to make a product successful in this aspect? It seems the slightest miscalibration can have people reject the robot. Only thorough testing with end-users can reveal this. Multiple ways the robot could gaze or many different sounds for communication should be tested for achieving the combination that evokes the best response. In much the same way as Hendriks et al. (2008) tried to find the preferred personality of the robot vacuum cleaner in "Vacuum cleaner personality and behavior". Companies have to spend a lot of time fine tuning this aspect.

In the case with the Roomba, iRobot seems to have created a robot that is placed fairly high on the curve in The Uncanny Valley framework, as stated in the

introduction. To further improve the design of the Roomba for example, the sounds it makes when bumping in to objects or how it communicates with the user via the LCD panel could be worked on. This could potentially make a huge difference in acceptance. The look and expression to strive for as stated in the introduction are that of Wall-E and RD-D2 at the top of the curve.

When moving into the more humanoid design it is important to keep the cartoonish look for now. It seems the technology has to be more advanced to attempt a more true to life design and people have to get used to robots operating close to us. The robot companion NAO from Aldebaran is well on the way with this concept. This design tells its surroundings that this is a robot, nothing more, and it is harmless and cute.

Finally, a perfect design is difficult to administer, as people will feel attracted to different kinds of looks and personalities. A good way to optimize acceptance would therefor be to ensure that the users are able to customize the unit to a very high degree to suit their own taste.

5.2.1 Customization

People should be able to customize the robot to fit their taste, enable them to create an emotional bond to the device and thereby be more satisfied. They should be able to choose the type of behavior, communication method and style, like you normally choose size and color, when buying the product or when you are setting it up. Developers should consider making it possible to buy a “silly” robot, a “neat” robot or a “cute” robot portrayed through its movements and communication attributes. Similar to the way we decide on what voice we want on our navigation system in our cars. Some want a female voice, some want a male voice and some have installed a funny cartoon voice like Homer from The Simpsons. In time it should even be possible to get a robot that evolves its personality as you get to know each other. It will develop its own little peculiarities and you will in some sense build a history together. As JU, from the focus group stated, she felt she had a history with her old malfunctioning laptop that strengthened the bond between them.

As we have learned, consumers create stronger bonds and adopt robots easier the more they involve themselves with them emotionally. With the Roomba a higher customer satisfaction was recorded if the consumers took part in the “Roomba culture”, for example by customizing the appearance and imagining it with a specific personality, than those who regarded the vacuum cleaner as just another machine. Of course it is a possibility that some will never want to get attached to robots in any emotionally way and do not want them to look too alive, but another possibility is that it is just a matter of time before all of us own a robot we love for more than its functionality.

Robot companies should strive for a product line where every robot, to some manageable degree, is able to be unique both in appearance and behavior. Of course you would have to be able to scale your production, such as starting with a unique robot that could be in different colors, shells, movement patterns and communication sounds. Also you should be able to buy it with many or few social attributes as some want robots to be more anonymous as we have learned from the focus groups and in depth interviews.

Another important aspect that customization helps mitigate is the overall symbolic value the robot elicits in your home. This is easier to get right when the consumers are able to customize the product.

5.2.2 Symbolic value

As with all other things we own, robots will send a message to the world about who we are. From the findings in the focus group one participant had concerns about being regarded as lazy if she owned a robot, where others from the literature felt they were modern and technological. Another participant from the focus group would be embarrassed running it when friends are visiting.

New technology always spawns skepticism in some people until it has been fine tuned to be really useful or marketed to be really cool or probably a combination. With customization you could probably come a long way with winning people over, but trends and trendsetters in society also have a big deal to say about when new technology is to be accepted.

Obviously these concerns, about the negative symbolic value a robot might bring, need to be addressed in the marketing campaign and turned around to something positive. It has to be portrayed as a status symbol people want representing them, or explained why you are not a lazy person for having a robot vacuum cleaner for example.

5.3 Marketing

There are many understandings of what marketing is. It is often confused with branding or limited to ads for example. In this case marketing is regarded as the act of investigating the market and actively promoting a product or service through various channels. Marketing is “pushing” the products onto the consumers with multiple convincing claims. Where as branding helps to “pull” in the consumers by stating what the product and company stands for. At the same time it always directly supports whatever sales or marketing activities are in play.

Branding in general will however not be looked at in this thesis as it is considered to be a more fundamental comprehensive task on a more strategic management level

of a company. But choosing a brand name to promote the product, in accordance with what has been said earlier, is however interesting to look at in this case.

First, however, the focus will be on how the personality of robots should be used in marketing and how a sales pitch can be derived from the means-end results of the in depth interviews.

5.3.1 Personality of the robot

It has been known for a long time that products can contribute to consumers' construction and expression of self by projecting some kind personality onto the device (Heding, Knudtzen og Bjerre 2009). It would not be a completely new thing to try and market products this way, however with robotic products this might be truer in reality reinforcing this tactic.

As indicated above, many things have to be taken into account when designing ADMRs. When the design has proven to be appealing the next task is to project the right thing to the audience.

You have to hit the deeper motivation for people to buy the product and address the concerns people might have all the way from the small functional concerns like "Will this robot really do what the ads say it will?" to "Will people think I am lazy for owning this robot?" Also you have to distinguish yourself from the competition.

One of the central points of this thesis is that the way people might project a personality onto these devices, now and in the future, should be an important factor when creating the marketing material for the promotion.

These personality traits and how the robot fits perfectly into the different types of families should be very noticeable in the campaign.

In a product review of the Neato BotVac on Youtube by Cnet[17] the host is impressed by how it performs and functions. However even though he feels it is a bit odd to highlight in a product review for a vacuum cleaner, he thinks the Neato has a bit less personality and entertainment value than the Roomba because of its methodical way of working. The Roomba bumps around more randomly and you cannot foresee what is going to happen next. Additionally he adds that people might have different tastes in this regard.

The vacuum cleaner has gone from being just a tool to suddenly having some sort of entertainment value. It has become a social product that affects our emotions. Until now, vacuum cleaners have been functioning and marketed merely as tools for the home focusing on technical specifications. But when it starts to move around on its

[17] https://www.youtube.com/watch?v=zdMYHJH-mh4

own like the Roomba and the Neato, suddenly it makes good sense to enhance the personality people naturally will project onto the devises.

When looking at the promotional video for the Roomba[18], hardly any emphasis is put on the personality or the entertainment value of the product. They promote the aesthetics a little bit, but mostly focus on technical specifications.

iRobot should consider adding the adorable and entertaining personality the product seem to posses, to the vibe of their video or as one of their selling points to some degree.

The promotional video for the Neato, as stated earlier does this a lot more. It seems people can relate emotionally to this product as the focus group revealed.

Here the Neato commercial did a good job convincing the participants that it was a good product because it was "cute" and seemed to be a part of the family. The personality of the robot was portrayed as likable or even adorable and charming.

Further as Neato seems to prove, companies can differentiate themselves by focusing on the personality of their product and use it as a driver of consumer loyalty.

5.3.2 Sales pitch

Regarding the underlying motivation for buying a product in general, or in this case ADMRs of the future, the in depth interviews provide valuable insights to this by applying the laddering technique. It is a powerful method, especially for advertising and positioning, but also for product development and preliminary segmentation (Saaka, Sidon og Blake 2004). People buy features and benefits that satisfy their personal emotions.

You can write ads or taglines with features, benefits, and emotions and develop unique selling propositions directly derived from the value chains.

Using the Massage Robot as an example, a pitch of the product could sound something like this:

[18] http://www.irobot.com/For-the-Home

From the functional value chain:

Tired of asking your better half for massages? (Personal value) *Stop wasting time discussing* (Psychological consequence) *and get rid of headaches from infiltrations with the new [Brand name] from [Company]* (Functional consequence). *The only massage robot with the sensation of real hands and multiple patterns* (Attributes).

or

From the aesthetical value chain:

Provide your living room with a constant feeling of wellbeing (Personal value). *The stylish red and black design of the [Brand name]* (Attributes) *fits nicely in every home* (Functional consequence) *and reminds you to get massages daily* (Psychological consequence).

This way the two value chains as seen in 3.3.2.2 are put directly in use.

Of course a product needs many interviews to make sure that the pitch appeals to as many people as possible. This respondent might only be one of few who have this problem of asking her husband for massages.

Also with many interviews clusters of people with the same personal value might also start to show and you are able to make segmentation and divert different selling propositions to different types of people.

Looking at the five interviews, generally it seems there might be some factors that recur with ADMRs. That is to save time to do other things like be with your family, earn more money, get more experiences - ultimately to realize yourself or get more quality in life.

These will probably be important factors to focus on when marketing these products in the future.

5.3.3 Brand names

The name of a product will indicate a lot about what vibe or personality it wants to project.

In the series Äkta Maniskor, the robots are known as Humbots, but each type has a model number like XR-T4a making them very machine-like. It is obvious the directors use this to portray them as soulless machines looking almost like humans. This works well because you have no way of identifying something good with XR-T4a. Roomba and Neato, however sounds more like a real name for a pet almost. Neato is most likely inspired from Fido or Pluto, as most of us associate with cute likable animals.

Pets are one thing we are familiar with running around in our personal space at home totally autonomously. So why not market these robotic social products as something similar to this so it feels alive and familiar? We have to live with this new entity so it has to fit in with our emotions, and have a suitable personality we can relate to. It should maybe even have faults like ourselves.

Further it seems that when something is classified as a robot or a machine, it tends to have a negative affect on the product, as we have learned from the focus groups and the Roomba findings. One participant from "My Roomba is Rambo" (Sung, Grinter og Christensen 2007) stated that he felt "A robot vacuum cleaner", as the Roomba was marketed, did not encompass all it was. Also it is important to guide the audience away from the stereotype, robots can be known for in movies, and to something more comprehensible. In other words companies should strive for branding and marketing their robotic products as something that corresponds to what they do and how they do it, not as a robot.

If this is done properly, one author suggests that when robots become useful, they cease to be robots and just become their brand name (Morton 2014). We all know this phenomenon from using Google. No one thinks they are using a robot when they are trying to find something on the Internet, they just "Google" it.

However, it seems the negative attitude towards "Robots" is starting to change. Big budget movies, and the media in general, are starting to portray robots as a good thing possibly making it appealing to classify something as a robot in some sense. Movies like Wall-E[19] and Robot and Frank[20] are already pulling the attitude in this direction as well as the Roomba has proved to be a "good" robot.

[19] An animated movie about a small robot working to clean on the earth while all the humans wait in space to return to the planet when it is habitable again (IMDb 2014).

[20] A movie about a retired cat burglar who, against his will, get a robot from his children to take care of him (IMDb 2014).

6 Limitations

This subject is very new and explorative making it difficult to say something entirely conclusive. The data and experiences about autonomous domestic robots are based only on the one existing AMDR, the Roomba, and are very sparse. In this beginning of an era, one new product with a new form of technology, or a new marketing style, could change everything we feel about robots presently. In fact, this will probably happen sooner than later with the growing number of resources put into this area.

The autonomy of the robots is at a very simple stage to this day. When this changes it is difficult to say what it will bring. Just like with the computer and the Internet, no one could have predicted all the possibilities and challenges they brought. Only one thing is sure and that is that robots are coming.

The data collection is limited to putting a perspective on the literature review and looking for general trends to be used in marketing. As stated throughout the thesis, a lot more data would have to be collected to successfully market an actual product in the future.

One important aspect that has not been taken into account, in the discussion about The Uncanny Valley and preferred personalities of robotic devices, is cultural differences. For example, Japanese people find humanoid robots far more appealing than people from the western world due to their cultural upbringing with manga cartoons, especially Astro Boy[21], and their love for technology in general (Morton 2014). The curve of the framework might look different across different cultures. This is however not mentioned in the literature it seems.

[21] Follows the adventures of a robot named Astro Boy (www.astroboy-online.com 2014).

7 Conclusions and future research

To start with, this thesis argues that we are in the middle of a robot revolution by presenting market data and citing multiple studies stating this. Autonomous domestic mobile robots are classified as a group of robots demanding special attention regarding design and marketing for better acceptance. They are denoted ADMRs.

The Uncanny Valley is explained visually with examples of robots and made central in the discussion about how the design of robots affects the way people react to them.

Further, the definition of what a social product, with a personality, is and how this is important regarding acceptance and how they should be designed and marketed is pointed out. To help argue that the acceptance of robots is highly driven by social factors, an article viewing the problem entirely from a theoretical social psychology point of view, is brought up.

Making out the core of the thesis, it is studied how people perceive and interact with domestic robots now, in the form of the Roomba vacuum cleaner, and how future robots are imagined and perceived by potential end-users.

It collects and reviews all available findings in this field and adds to the previous literature by visualizing how these support or contradicts each other in a single custom-made figure. Also, the thesis contributes by conducting a focus group and five in depth interviews, studying what people want and how they might perceive these products in the future. The focus group took on a broad discussion about ADMRs, where the in depth interviews focused on the underlying motivation for wanting an imagined ADMR.

Finally, the main contribution to the literature is a far more comprehensive section on managerial implications, of designing and marketing the next generation of ADMRs, than previously performed.

7.1 Conclusions from Managerial implications

Several factors were discussed to help developers and marketers optimize their design and marketing efforts with ADMRs now and in the future.

7.1.1 Design

- The design of the robot has to balance between not looking too much just like a machine and not too lifelike, as the The Uncanny Valley helps to clarify.
- Small changes to the social attributes could improve likability, but also do the opposite. It is a balance that needs to be tested and fine-tuned thoroughly in development.

- Humanoid robotic products should strive for a cartoonish design with the technology available today, to not end up in valley of The Uncanny Valley framework.
- Customization should be available to the consumers to a very high degree. They should be able to choose between different styles and personalities to help optimize likability and thereby acceptance and satisfaction of the consumers.

7.1.2 Marketing

- Potential concerns of negative symbolic value are important to investigate and eliminate when promoting the product.
- It is important to stress that the robot has a personality that is likable and would fit nicely into your home and personal space.
- Companies can differentiate themselves on the unique personality their robots possess.
- The Means-end approach and the laddering technique will yield the true underlying value of getting a certain robot. Also the value chains can be used directly to generate sales pitches in marketing.
- The general underlying motivations for getting an ADMR in the future seem to be driven by saving time to be with the family, earn more money, and get more experiences. In turn, enabling the consumer to realize him or herself or get more quality in life.
- Social robotic products should have brand names that indicate familiarity and positivity on an emotional level.

7.2 Future research

In this section a few ideas for future research are pointed out:

- It would be interesting to find out whether you are able to segment people regarding the social involvements of robots. It seems there might be people that like to anthropomorphize or zoomorphize robots more than others. NI from the focus group stated very clearly that he would never get emotionally attached to a robot and that it should be anonymous. Other clusters of personality types might reveal themselves if this is studied specifically.
- Building on top of the above, it would be interesting to try and uncover the cultural differences in what is appealing considering the design of robots.
- The symbolic value of owning different types of robots would also be interesting to study more closely. Especially in conjunction with trends in the society and cultural differences.

- As the Roomba has shown, an ADMR can spawn a whole user-culture that supports and discusses the product. This is known from many products where companies gain from co-creation and community knowledge. Maybe this can be leveraged differently with social robotic products that possess a personality.

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9 Appendix I

Focus group 22nd of may

The focus group was conducted with 5 participants that were happy to share their thoughts.

The group consisted of two males and three females:

Jonas (JO)

27 years old, full-time job, owns his apartment, has a roomie, and single.

Niels (NI)

25 years old, student and rents an apartment with his girlfriend.

Thea (TH)

31 years old, full-time job, owns her own apartment, lives alone, and single.

Julie (JU)

30 years old, full-time job, owns her own apartment, lives alone, and has a boyfriend.

Jannie (JA)

31 years old, full-time job, owns a house with her husband, and has a 2 years old son.

Irrelevant talk is left out of the transcription, but clearly marked. Pauses are marked with "…" no matter how long they are.

Confirming "yes"- and "no"- statements are also left out throughout the transcription.

Observations and moods of the person or group are written in brackets throughout the transcription.

(The recording starts)

Me: Ok vi skal snakke om robotter til hjemmet. Og det er sådan semi-struktureret heddet det, så jeg stiller nok nogle spørgsmål hen ad vejen for at guide det i en eller anden retning, men egentlig skal jeg ikke rigtig sige noget i skal bare snakke med hinanden – bare sige hvad man har lyst til. Der kommer ikke en række af spørgsmål så det er helst bare om at tænke… lade sine tanker køre ud i en eller anden associationsrække og så kører man bare derudad. Det behøver ikke være så specifikt.

(A bit of laughter. TH: jeg tør næsten ikke sige noget.)

Me: Vi starter bare sådan lidt bredt. Vi skal bare sådan snakke om hvad synes I om robotter i hjemmet? Hvad siger I til det når I tænker på det? Og så arbejder vi os så lidt længere dernedad. Så hvis vi bare forholder os til det først. Når jeg siger robotter til hjemmet – hvad tænker I så?

JO & JA: Støvsuger (Giggles)

JU og TH: Jarh. Støvsuger.

Me: Robotstøvsugeren?

TH: ja.

JO: Plæneklipperen.

JU: og derefter tænker jeg på The Jetsons family, den der tegnefilmsserie.

TH: Jeg tænker også alle de der film. Alle sci-fi-filmene hvor man for lavet alle de der, hvad hedder de, aviators, sådan nogle kopier af sig selv og alle de der fremtidsfilm med alle mulige robotter.

Me: Avatar?

TH: Ja Avatar! (Happy tone)

(Laughter and nonsens talk. 1:23-1:45)

TH: Men er der ikke også denne der iRobot eller hvad hedder den med Will Smith hvor de også har alle de der robotter der skal klarer det hele?

Me: Der er det også sådan nogle robotter til hjemmet.

JU: Nu tænker jeg på sådan nogle der… em… Hos mine forældre der har de sådan en… øh… jo, tænd og sluk timer. Er det også en robot? Arj det er det nok ikke.

Me: Det er jo så det.

NI: Det er jo svært at definere en robot. Det er jo elektronik det hele.

JU: Ja hvad er en robot?

TH: Hvad er en robot, ja. En blender er det en robot?

JU: En elkedel?

NI: Er det når den bevæger sig…

TH: Bare den har et eller anden form for arm der gør noget.

JA: Den der støvsuger har da ingen arm.

JO: Hvis man tænker robot er det så ikke noget med at personificere…

NI: Hvis de har kunstig intelligens eller noget?

JO: Præcis, at det er en form for person. Jeg ved i hvert fald at min mor har sådan en robotplæneklipper oppe i hendes sommerhus. Hun kalder den… hun har givet den et navn simpelthen – Roberta. Det er lige som om den har fået en person. Lidt lige som et dyr man har ik? Lige som en hund der render rundt og siger vov, har man en plæneklipper der kører rundt i haven.

NI: Men det ku du jo også ved alt muligt andet.

JO: Men gør du det?

NI: Der er vel også nogen der har en almindelig støvsuger de kalder et eller andet?

JU: Deres cykel kalder man jo også noget.

NI: Jeg tror ikke det er der den ligger.

(Random talk)

NI: Er det ikke mere det at den bevæger sig ud fra et eller andet prædefineret den skal? Og så at det er bevægelsen i det. Det at den ikke er stationær. Man sådan tænker lidt robotten ind over. Fordi det er jo ikke fordi en robotstøvsuger udfører en anden funktion i hjemme end en elkedel bare altså… Men den bevæger sig for at gøre det. Den står ikke stationær.

JO: Men der er alligevel mere arbejde i det med en vaskemaskine eller en elkedel, fordi der skal du sætte den i gang, time den, sætte den på et eller andet program. Hvor en robotstøvsuger den starter selv og slutter selv. Det er måske derfor den har en defination af at være en robot.

JU: Men jeg synes du har ret i noget. For mig, hvis et apparat kan noget selv uden jeg skal starte den så synes jeg den har lidt mere liv, men jeg synes og min opvaskemaskine er en robot lidt. Fordi så kan den sådan lige – nå nu skal jeg tørre. Så går den selv over på et andet program.

JA: Man kan måske også time den lidt faktisk? At den skal starte om 5 timer måske.

TH: Det er lidt lige som den der film transformers. Der leget man lidt med ideen om at alle de der små elektroniske udstyr i virkeligheden kan transformere sig ind til en større eller mindre robot.

JU: Har i set den der Nokia reklame hvor deres telefon kan transformere sig om til en ninjafigur? (Jokingly)

(Small talk)

Me: Nogle flere ideer om hvad en robot er?

NI: Meget spændende diskussion egentlig om det er det at den gør noget af sig selv eller hvad det er der definerer det?

JA: For 10 år siden ville man nok have tænkt på noget mere menneskelignende før man havde denne her robotstøvsuger.

NI: Ja, hvis du havde sagt en robot støvsuger for 10 år siden havde de tænkt en robot der gik rundt med en støvsuger.

TH: Det er måske noget der er programmeret på en måde til at kunne noget?

NI: Noget kunstig intelligens eller noget. Den kan selv finde ud af hvornår der er støvet, hvornår den skal i gang med at tørre i forhold til hvor rent det nu er, hvad der nu er afgørende for hvornår opvaskemaskinen begynder at tørre.

JO: Skal det være noget sådan fysisk? Fordi jeg har set den der film "Her" som kom ud her i starten af året. Jeg ved ikke om i har set den, hvor en fyr bliver forelsket i denne her kunstige intelligens som er et styresystem. Et OS. Og det er jo også i princippet en robot. Eller det ved jeg ikke om det er?? Det er bare ikke noget fysisk man kan tage og holde på.

NI: Lige som Siri på ens iPhone.

JO: Ja, men jeg ved ikke om jeg vil sige DET er en robot som jeg forstår en robot.

Me: Det er interessant. Jeg kan godt gå videre faktisk så. Fordi at når jeg tænker på robotter så har jeg afgrænset min opgave til netop at tale om mobile intelligent autonome robotter. Dvs. de skal altså kunne bevæge sig rundt i hjemmet og de skal være autonome. Dvs. de skal kunne tage deres egne beslutninger. De skal ikke være forprogrammeret til at kunne gå 10 meter den vej 2 meter den vej og så gå tilbage til sin plads 5 meter den vej eller sådan noget. Det skal være sådan at når den bumper ind i et eller andet er der en sensor der siger nu skal du gå den vej. Dvs. den tager sin egen beslutning. Den er intelligent ik? Det er sådan det jeg har afgrænset med og der findes… Ej det skal jeg ikke snakke om. øhm…

Og det som de her så kunne gøre, kan man så sige, at de kunne hjælpe med noget i fremtiden, rengøring, oprydning, madlavning, havearbejde. Noget hygiejne i hjemmet, måske noget helbredstjek. Måske noget lagerstyring af af de ting man har og noget sikkerhed måske. Måske være instruktøragtig hjælpe med noget økonomi, fitness instruktør nærmest derhjemme. Organisere og filtrere information man får ind. Eller måske hjælpe med hår, make up, massage

underholdning og sådan noget. Alle de ting man gør i hjemmet. Så man skal bruge en robot der lige som er mobil autonom og intelligent for at kunne løse de her ting.

Når man tænker på de her ting. Hvad kunne så være vigtig for jer med en robot i hjemmet? Det er ikke sikkert alle de her ting er noget i nogensinde kunne overveje at bruge en robot til, men hvad kunne være vigtig for jer hvis i skulle have en robot i hjemmet? Hvad skal der til for at den er værdifuld for jer?

NI: Støvsugning, rengøring, vasketøj.

(People agree)

JO: Vaske tøj det ville være sejt ja. Hvis den kunne selv hænge det op og tørre det…

JU: og ind i skabet.

NI: nå, ja folde det sammen og stryge det.

JA: gud ja. Og lave mad måske faktisk. Arj!

(JO og NI disagrees)

Me: I ville ikke bryde jer om hvis den lavede mad?

JU: hvorfor ik?

NI: Det vil vi da gerne selv gøre. (Almost insulted)

JA: det vil man gerne selv NOGLE gange.

NI: Ellers vil jeg gerne købe det af nogle andre mennesker der har lavet det.

JO: De har levet en robot ovre i USA for at hjælpe med at sammensætte nye madretter. Så kunne den kombinere smage på nye måder. Krydderier og råvarer til noget man ikke vidste man kunne fremtrylle på den måde. Den kunne sige at et æble og en citron smagte godt sammen men den ved ikke hvor meget den skal bruge af hver. Og så kunne de bruge det til at lave nye retter ud fra det. Men jeg er helt sikkert med på din vogn Niels med at…

NI: Det fjerner et eller andet element fra det der gør det lækkert.

JO: Det er måske også bare fordi det er rart og hyggeligt, kontra at gøre rent hvor det er mere trist.

JU: Det er ikke fordi i synes det er forkert? Det er bare fordi i synes det er hyggeligt? (Asking JO)

JO: Ja, det er ikke fordi det er forkert.

NI: Jeg synes det er synd at fjerne det fra hjemmet.

Me: Hvad med jer piger? (At TH and JA)

TH: Jamen det tænker jeg også, hvor man allerede nu har erstattet alle mulige med robotter hvor man før sad og samlede alle mulige kedelige ting sammen. Men der er

jo ikke på sammen måde de der kedelige arbejder ting i hjemmet. Hjemmet er bare noget helt andet. Man har heller ikke lyst til at gøre hjemmet til en arbejdsplads hvor tingene bare kører per automatik.

NI: Men forsøger folk et eller andet sted ikke at gøre det?

TH: Men hvor mange KØBER egentlig den der støvsuger? (Doubtful tone)

NI: nå, ja men jeg tænker bare i ens processer i hverdagen alligevel… Du ordner vasketøj jeg laver mad, du henter børnene. Et eller andet altså at man i forvejen prøver at strømligne det på en eller anden måde. At man gør hver dag ens for det fungerer mest gnidningsfrit.

JA: Jeg tænker nemlig på madlavningen. Altså en Au pair får folk jo også. Altså hvis det var en robot til lige at hjælpe lidt. hvis man havde hentet ham den lille kl 17 og der så lige var mad uden jeg behøvede… Arjh! (Like she would be relieved)

TH: Eller bare indkøbene ik? Hvor der er sådan en bil der bare kører (whistles). Så bestiller man bare og det er der jo allerede hvor der bare er en mand der kører.

JO: Det dræber også lidt kreativiteten. Men det er måske også fordi det er sjovt at lave maden. Så ville det bare ødelægge noget for en.

JU: Hvad nu hvis man ikke synes det er sjovt at lave mad?

JO: Ja så ville det være genialt. Måske hvis man havde 5 børn. Og hellere ville bruge tiden på noget andet derhjemme. Så kan jeg da godt forstå det. Men jeg tror det er fordi det skaber noget værdi for en og det gør det i hvert fald ikke med rengøring for mig. Man gør rent og så kommer det tilbage man bliver fandme aldrig færdig. Mad der får man noget værdi ud af det. Man kan putte det i munden og…

TH: Sådan en robot der er en menneske robot, det kan jeg måske ikke helt overskue, men de der robotter der er sådan hjælpemidler. Lige som en videreudvikling af mikroovnen hvor maden ”pang”, er færdig og nærmest selv kan lure hvad den skal gøre. Man stiller bare lige et eller andet ind om man selv bare lige kan trykke lige det og det. Altså sådan at det ikke bliver nogle menneskelignende robotter med arme og ben, men mere sådan nogle…

JU: Der er denne der brødbagningsmaskine, hvor man bare putter ingredienserne i og næste dag så starter den selv om. Først ælter den og så bager den. Sådan en har min far og han har altså ikke brugt den særlig mange gange. Og er fordi den er ikke helt smart endnu. Der er sådan hul i brødet og den bager sig lidt fast og den var ikke så god til at tænke at i morgen ville han have brød dagen før. Hvis du skal programmere din robot så skal gulerødderne ligge et helt bestemt sted. Hvis du skal have svensk pølseret. Gulerødderne skal sikkert have en helt rigtig størrelse for at den kan finde ud af at skrælle dem. Så kommer man hjem og så har den bare skrællet noget forkert (Laughing). Jeg tror der er rigtig mange irriterende ting ved det der.

JO: Vi havde faktisk og en brødmaskine da jeg boede her. Den brugte vi også kun et par gange. Det der med at man var ikke helt entydig på at man ville have brød næste dag og der var hul i det. Det var ikke så smart. Og det er jo ikke fordi man ikke selv kan bage brødet. Det er jo relativt simpelt.

JU: så er en au pair smartere ik. (As a funny remark)

(People giggling)

Me: Hvorfor ville det være så meget anderledes hvis det lignede et menneske? (At TH) Det snakkede du om før.

TH: Hmm… Det tror jeg bare ikke helt på. Fordi altså jeg tror altid at vi vil synes at mennesket er superb. Der er ikke noget der kan slå det. Så det er mere de hjælpemidler, forlængelser til mennesket.

NI: Man vil gerne differentiere sig lidt fra det. Robotten skal være noget andet end en selv altså…

JU: Jeg tror den kommer til at minde os selv om vores usårlighed hvis den ligner os. At vi skal dø og den skal leve.

NI: Ja, det er faktisk en rigtig god pointe.

JU: Hvis den ligner et menneske så er der jo nogle ting. Os mennesker vi skal dø og bliver gamle. Vores led virker ikke og sådan noget. Den der robot kan bare blive ved så hvis den imitere os… for det første kan jeg ikke se hvorfor. Vi er ikke særlig praktiske synes jeg. Os mennesker vi sådan en utrolig lille fod i forhold til vores hvilepunkt. Der skal ikke så meget til før vi vælter. Det tager mange år for at lære at holde balancen. Det er smartere med en robot der er sådan lidt mere sådan her (drawing pyramid form in the air). Så hvorfor skal den så ligne os hvis den skal kunne noget andet? Det er der jo ingen grund til. Og så tror jeg den vil minde os om at…

NI: At den der robot du købte da du var 20 den er lige så god den var den gang.

JO: Man kunne forestille sig en robot der bliver gammel sammen med en måske.

JU: Ja det kunne man godt.

NI: Det er da en virkelig dum ide.

JO: så putter du bare noget nyt hud/skin på den når den næste skal have den. Og der kommer jo også nye modeller så alt andet end lige vil den jo blive skiftet ud og blive smartere.

JU: Så skal den hedde Robutler (jokingly.)

(Laughter)

Me: Uanset hvordan deres udformning bliver. Lad os ikke forholde os til det så meget. Hvordan skal den opfører sig. Hvilket forhold kommer man til at have til sådan en. Eller hvilket forhold vil man gerne have til sådan en?

NI: Jeg kommer aldrig til at have et forhold til sådan en (firm statement).

JU: Jeg kommer til at elske den.

TH: Jeg kommer også til at elske min.

JU: Haha kysser med computeren.

TH: Ligesom min computer og min cykel.

JA: Nå, ja det elsker man (Enthusiastically).

NI: Jeg ville bruge det udelukkende som et hjælpemiddel. Kommer aldrig til at have et forhold til sådan noget.

JA: Jeg elsker også min støvsuger (Jokingly)

NI: Nå, men jeg elsker den funktion det udfører, men jeg kommer aldrig til…

Me: ikke sådan emotionelt? Du kommer ikke til at kalde din robotstøvsuger for Roberta?

NI: Nej. Det kunne jeg ikke.

TH: Hvis nu du giver 100.000 for den bliver den så ikke lidt mere værd? (At NI)

NI: Det kan jeg ikke forholde mig til. At personificere noget. Det er nok mig der falder uden for normalen her. Folk der har kæledyr og sådan noget det kan jeg heller ikke sætte mig ind i. Altså… Det er produktionsredskaber for mig. Der er jeg meget kontant med sådan noget.

JU: Hvad hvis vi skal lidt tilbage i tiden. Har du ikke haft et eller andet fjernsyn. noget nostalgisk? (At NI)

NI: Jeg har altid bare brugt det for det det kan.

(Random talk about clothes)

TH: Men hvordan var denne der film egentlig. Var den overbevisende? Blev han forelsket i robotten der?

JO: Mmm. den er meget go og overbevisende. Meget speciel anderledes. Det der med at de skabte et emotionelt bånd imellem sig kunne godt lade sig gøre. Fordi hun kunne sætte sig ind i hans verden og hun blev hele tiden klogere på den verden omkring sig og omkring ham også. Og så kunne hun følge med sådan visuelt igennem hans telefon. Det er måske også derfor man kan sætte sig selv lidt ind i det fordi man har jo sin telefon med overalt og det fylder så meget i ens hverdag efterhånden. Ikke fordi man måske har et kærlighedsforhold til den, men man føler sig også lidt nøgen uden sin telefon lidt a la hvis man gik med ur eller smykker at det betyder noget at have med i hverdagen uden at man rigtig ved det. Hvis man begynder at tænke over det så fylder det bare så meget. Så kunne de kommunikere på den måde.

Me: Det var jo lige som at der var et menneske i den anden ende ik?

JO: Jo, et evigt skype-opkald uden at der var et ansigt på hende.

NI: Men det her styresystem eller hvad det nu er det er ekstremt meget udviklet så. Altså det har en eller anden form for kunstig intelligens. Det er ikke lige som Siri der kun kan svare på nogle forprogrammerede ting.

JO: Det der skiller kunstig intelligens fra sådan noget som Siri er netop det at det er i stand til at lære og blive klogere. Og det er Siri jo også i sin grad, men det er jo noget andet end når man snakker. Den her den kunne lidt til at starte med. Den kunne svare på tingene og så blev hun bare klogere og klogere og tilegner sig viden. Det er ligesom det der udmærker sig til at være RIGTIG kunstig intelligens for alvor. Når de kan lære lige som at blive klogere mennesker. At de blev så kloge at de lige som droppede menneskerne.

JU: Og det er jo det alle er bange for. Alle de der sci-fi film. Man skal helst kunne slukke for dem.

TH: der skal helst ikke være udvikling i dem. De skal bare være et stadie. Så er man tryg. Så ved man det er det de kan og man er sikker på det. Det er det den kan sådan.

JO: Altså en funktionel robot på en eller anden måde. Den skal kun kunne det der.

TH: Den skal slet ikke komme og sige sådan hov Thea nu skal du altså snart. Hold kæft du roder… (Jokingly)

(Laughter)

NI: Men ødelagde jeg det før i forhold til at personificere den. Var jeg ikke den eneste der fik lov at sige noget der?

JO: Nej, jeg synes heller ikke jeg sætter navne på mine ting, men jeg er ekstremt glad for min cykel fx og tager den med op i min lejlighed fordi jeg ikke vil have den stjålet og synes den er rar og glæder mig hver morgen til at skulle cykle på arbejde. Jeg er glad for min seng og min nye hovedpude.

TH: Jeg er enig, men det er mere den der affektionsværdi som er en anden form for værdi end sådan en personlig… forelskelse.

NI: Det er også derfor jeg vender tilbage til det fordi at jeg synes det er interessant at folk gør det og folk kalder deres ting navne og sådan noget, men jeg har bare ikke selv denne der… jeg ved ikke om det er fantasi eller hvad det er.

TH: Jeg tror også det er lidt specielt. Jeg tror ikke der er så mange der gør det.

NI: Det tror jeg faktisk der er. Jeg kender rigtig mange der gør det.

JU: Men jeg synes mac-computere. Jeg har lige skiftet til sådan en. Der er det mere indholdet der gør det og hvad den kan. Men den gamle computer jeg havde den var så mærkelig. Man skulle lave alle mulige genveje for at komme ind og den havde sin personlighed. Det var kun mig der ku åbne word og sådan noget. Så den fik en personlighed og jeg tabte den mange gange og den virkede altid og det blev sådan

helt overtroisk at den bare altid var der for mig ik. Men det var jo kun fordi den havde fejl. Mac kører så uproblematisk at den er blevet lidt for kølig. Den har ikke nogle personlighed.

JO: Det er måske også det der med mennesker. De har jo også fejl der er personlighed. Nogle ting der skiller dem ud fra de andre. Hvor hvis noget bliver for kølig og kold. En robot der kun kan det og det. Så bliver det måske for standardiseret på en eller anden måde.

JU: Mit liv er blevet bedre af at det bare virker, men det er desværre ikke et lige så tæt forhold. Men tingene er nemmere nu. (Relieved tone)

Me: Det er måske et spørgsmål om hvor livlig en ting er før man kan begynde at personificere den?

NI: Det er i hvert fald nogle særtræk der gør den anderledes end de der er fuldstændig magen til ligesom computeren der opfører sig mærkeligt. Den der er kommet ud af fabrikken et sekund før er jo fuldstændig magen til og kan det samme. Fordi du nu har tabt den og fordi der er virus på højest sandsynlig og det ene og det andet. Så skal man gøre et eller andet. Det er det der skaber den der personlighed. Det er det der gør at du tilegner dig det der forhold til den.

JU: Men tror i ikke hvis man… Ida - du siger hun har en robotstøvsuger. (At JA)

JA: Ja, men jeg ved ikke om hun bruger den.

JU: Tror I ikke man automatisk vil tænke, Ej hvor er den dum. Nu sidder den fast igen. Tror i ikke man ville tænke det?

TH: Jeg tror ikke jeg ville have tålmodighed til sådan en dum støvsuger.

Me: Har man ikke allerede tilegnet den en form for personlighed når man kalder den for ordet ”dum”?

JU: Jo!

TH: Jo, men så intelligente er de jo ikke blevet endnu.

Me: Jo men jeg mener bare man bruger ordet dum om en genstand. Har man så ikke allerede tilegnet den en form for intelligens.

NI: Det er jo fordi du tillægger den en eller anden intelligens på en eller anden måde. At du forventer den er mere intelligent end den reelt set er. Fordi du har en forestilling at den kan støvsuge stuen uden problemer. Den sidder fast i noget så kalder du den dum fordi den er dummere end det forventede niveau.

TH: Ja det er ikke fordi den mobber og siger grimme ting den er dum. (Exaggerating)

Me: Men ville du sige at en blender er dum, hvis du satte den i gang og så smed noget dyrt ned i og så den ikke kunne finde ud af at stoppe selv.

TH: Nej.

NI: Men det ville du heller ikke sige om en støvsuger der suger en dyr fingerring op. Det er mere det der med at den sidder fast i et guldtæppe. Man har forventet det mere af producenten mere end af støvsugeren måske.

(Random talk)

---------- The Fifth Element ----------

Me: Men ok lad os prøve at se nogle sci-fi klip om ideen om en robot i hjemmet. The Fifth Element fra 1997. Et meget kort klip og har ikke så meget med selve filmen at gøre, men her er et bud.

(People are excited)

(Clip plays. 25:19-26:05)

Me: Det handler selvfølgelig ikke så meget om det de siger, men om robotterne der kommer ind… Hvad synes I om sådan nogle robotter der kommer ind på den måde der?

NI: Praktisk.

Me: Ville det være rart at have sådan en i hjemmet?

JO: Det kan man jo godt have. Robotstøvsugere. Det er jo lidt det samme. Jeg synes det er genialt med den min mor har. Der er altid nyslået græs. Ligesom en golfbane. Det er altid pænt.

JU: Det er sjovt jeg ville ikke gøre det mens jeg var hjemme og foran nogen nogle af mine venner.

Me: Så ville du ikke tage din robotstøvsuger frem?

JU: Nej, den må køre når jeg ikke er hjemme.

NI: Nej det ville også være irriterende sådan indimellem benene på folk.

(Laughter)

NI: Hvad gør man så hvis der er fest og der står 15 mennesker og der er en af dem der taber et eller andet på gulvet. Ville man så selv begynde at stå og støvsuge og skrabe sammen eller ville man lige… Vi skal lige have en meter rundt her. Så trykker man lige på knappen og så kommer… Roberta.

JU: Ja, det er et godt spørgsmål.

Me: Er det sci-fi eller virkelighed tror I?

TH: Altså jeg synes ikke det er langt fra virkeligheden. Det kunne man sagtens forestille sig. Det er mere om folk reelt gider at have det.

JU: I virkeligheden er det jo kun en. Han havde brug for 3.

Me: I virkeligheden er vi kommet længere end det den film postulerede i 1997. Nå, vi har været godt omkring det. Lad os se denne her sådan lidt mere ekstreme udgave.

JU: Men jeg synes… Nej vi er ikke færdige. For der er noget med det med at gå på loppemarkeder og købe gamle ting og man høvler sine gulve ned så træet kommer frem og man får en følelse af… At man har haft en fortid og ting ikke kan sige noget… Så pludselig har man sådan en støvsuger der. For mig passe de to ting ikke sammen. Man prøver at lavet et hjem som er lidt – det får mig til at slappe af og så vil den robot ikke passe ind. Så hvad gør jeg. Jeg tror ikke jeg skal have sådan en.

NI: Det fjerner et eller andet. Noget æstetisk, noget kulturelt, noget…

JO: Men hvad så hvis du klædte den ud som noget gammelt? (At JU)

JU: Det kunne godt være for jeg har faktisk en retro støvsuger som jeg elsker. Så måske derfor jeg gerne vil have sådan en når jeg ikke er hjemme. Totalt hypocret… Men det er jo bare fashion.

JO: Men altså du siger den ikke passer ind. Min mor har jo givet den et navn og sådan noget. Hun synes jo den er hyggelig at den drøner rundt der når hun selv ikke er der.

JU: Det er heller ikke inden for.

JO: Nej det er udenfor. Det er måske lidt anderledes. Men det der med at hun har givet den et navn. Hvis nu du fik et personligt forhold til denne her støvsuger. Så ville den jo være en del af hjemmet.

JU: Jo, men det er rigtig nok. Men designet skulle være fedt og passe ind i ens hjem.

---------- Äkta Maniskor ----------

Me: Så prøver vi og… Det er en svensk serie der hedder Äkta Maniskor. Først så ser vi bare lige hurtigt en reklame for en hjemmelig robot. Så prøver jeg lige bagefter at finde et sted hvor de går ind og skal købe en i en butik for robotter kan man sige.

(Commercial plays. A commercial showing very humanlike robots helping out in the house almost like an au pair girl. They are called Hubot because they are so humanlike. Also they have a very techical name like XBD-20.)

(A little bit of confusion is explained)

(Clip from the robotshop plays. A shop where the robots are showed on pedistals. Different looks, skills and pricetag. A dad, grandad and a son looks around. A salesman pushes a sale onto the grandad – an expensive model but throws in one more for free to the dad and his family. They get home and brings in the box with the Hubot in and starts it up.)

Me: So kan man godt forestille sig at man får en robot der klarer det hele i hjemmet. Bare sådan for at blive inspireret til hvordan det ville være at have sådan en.

NI: Pænt nej tak.

Me: ville det være for mærkeligt.

NI: ja. Den er for personlig. Så skulle man nede i butikken bestemme hvilke træk den skulle have. Hvem bestemmer hvordan den skulle se ud.

TH: Det kan blive for perfekt det hele. Det kan vi ikke lide.

JA: Jeg vil kun have hende den gamle. (Jokingly)

NI: Også mand, kvinde der skal ned og købe sådan en sammen, vil man så have en mand eller en kvinde. Mørkhåret lyshåret? Store eller små bryster.

TH: Vi kan ikke lide konkurrenter.

JU: Spiller med vores instinkter ikke. Det med at være lækker og ung og…

Me: Er der slet ikke nogen der ville have sådan en?

(No one wants one)

JO: Men altså der med sagt, der er mange ting vi ikke ville have for 10 år siden som vi har i dag. Men sådan som det er her er det for syret. Hun vågner i den der kiste som jeg ser det. op fra de døde på en eller anden måde. Og så er hun 25 år. Det er lidt underligt.

(Explaining a misunderstanding in the clip)

Me: Tror I det er et realistisk billede af fremtiden?

(People agreeing no)

NI: Jeg tror de vil have lidt mere robottræk. Og den er alt for upraktisk. Hvordan kommer den nogensinde op af den kiste der. For et hvert menneske ville jo vende om på maven og op på knæ for at komme op. Hvis man skulle lave noget der skulle klare ting i hjemme ville det være meget mere praktisk hvis den så anderledes ud.

TH:Mhmm… der er ingen grund til at den skal ligne et menneske. Det er også de færreste der køber de der lolitadukker.

JO: Men vi snakkede også om før at de skulle passe ind i hjemme ellers ville man heller ikke have dem og ens hjem ville ikke føles hyggeligt. Nu snakker vi meget om udseende. Det bliver for personligt – det går for meget op mod menneskets kvaliteter.

JU: Der er R2D2 jo ret hyggeligt. Den har sådan en retrovibe.

JO: Ja det er selvfølgelig rigtigt.

TH: Men hvad er funktionen. Vil man heller have noget der afspejler funktionen eller noget der er sminket til at være altmuligt andet. Det er jo et generelt designspørgsmål. Man gider ikke at fake noget.

JU: Altså et bord skal ligne et bord. Ikke noget andet.

NI: Det er faktisk rigtigt. Den skal afspejle funktionen. Hvis den skal se sådan der ud så skal det være fordi den skal benyttes den funktion vi godt alle sammen ved hvad er ikke.

TH: Ja netop.

(Laughter)

NI: Det kunne være den eneste grund til at den skulle se sådan der ud. Ellers er den jo upraktisk.

TH: Men hvorfor. Den er sådan lidt klam.

JU: Døde øjne.

TH: Det er worst case skræmme scenariet filmen stiller op. Hvad kunne man længst ude drive det til.

Me: Men nu kan man så sige at de fremstille den menneskeligt på en sådan klam/dårlig måde. Men kan I slet ikke se for jer en menneskelig robot for jer i en eller anden sammenhæng man kunne have lyst til at have derhjemme? I mener den skal afspejle funktionen?

JU: Den eneste grund til jeg kunne se menneskelige robotter så er det nok sådan noget sexuelt. Men så er det også det de skal kunne. Så skal de trigge instinkter.

TH: Ellers skal det være nogen som er lige som en selv og så sender man dem ud og nu er du så mig. (Jokingly)

JU: Og så snyder man.

NI: En der kan holde om en om natten (jokingly)

JO: Nu vender jeg tilbage den film ”Her” igen, fordi der virkede det altså ret godt. Til at starte med virkede det lidt underligt, men så havde de et ret godt forhold sammen og det er det med at han var meget alene fordi hans kone var død. Hun var virtuel ikke fysisk. Så det kan godt var at den afstand der var til det fysiske.

NI: Der vil helt sikkert være subkulturer. Altså folk der gerne vil have sådan en der. Der ville synes det kunne være sjovt eller interessant og ville få et forhold til den. Ligesom der er med de der livedukker som ligner rigtige mennesker, men netop ikke kan noget. Men nogle behandler dem som deres kone/kæreste.

JU: men det som du forklarer, det er ligesom to forskellige ting (at JO). Der er næsten ikke nogen forskel på det du har fortalt og at have et langdistance forhold over Skype et år ik.

JO: Nej præcis det er lidt det samme.

JU: Så det er det der med at blive forstået af en der kan spejle tilbage. Så er det så robotten der trækker på at lære ham bedre og bedre at kende og så tilpasser sig med den viden den får. Det er jo ikke engang sikker han ville være blevet forelsket hvis han havde set robotten fordi så havde han set de kolde øjne.

JO: Men den var altså i stand til at lyde virkelig og grine med ham.

TH: Jeg tror der er mange flere muligheder med sådan noget. Men lige så snart det skal være et fysisk design… Når man tager noget kultur og gør det fysisk er det bare langt mere kompliceret.

JO: Det er også sjovt at den som de har fået med hjem her er en asiatisk au pair-agtig model. Man bygger videre på at en au pair det er en der kommer fra udlandet på en eller anden måde ik?

NI: hvem har lige bestemt den skal se sådan der ud? Fordi man må jo kunne vælge alt på den der.

JU: Jeg så også denne der film der skal handle om hvordan vi behandler andre mennesker. Måske det mere er en samfundskritisk film end en film om robotter?

Me: Men hvordan tror i det er i forhold til virkeligheden? Tror i vi kommer til at lære mindst lige så meget om os selv når vi laver robotter der er mere virkelige?

JU: Er vi blevet bedre mennesker fordi vi har polske arbejdere der arbejder for lidt lavere løn. Indtil videre er vi ikke blevet bedre mennesker. Men da jeg var lille kan jeg huske min far snakkede om vi skulle have et andet slags menneske der var lidt mindre og bare elskede at vaske op fordi når man kigger tilbage i historien så alle de store tanker… grækerne der lavede geografi. De kunne jo kun gøre det fordi at de havde slaver ik. Og vikingerne havde slaver. Så jeg har altid tænkt. Vi skal have slaver ik (jokingly), men på en etisk måde så dan har jeg altid prøvet at knække. Men det er jo også derfor vi har vaskemaskine i dag. Det er fordi vi skulle have mere tid til at kunne sidde og lave det der virkelig betyder noget og det er jo ikke lykkedes endnu. Vi har stadig lige så travlt og det er jo ikke fordi vi er mere sammen med vores børn af den grund. Så jeg er ikke engang sikker på at bare fordi vi får en robot der hjælper endnu mere til at vi så…

NI: men dengang… Det var ikke fordi ve ville have mere til med deres børn at de havde slaver. Det er jo også slaver et eller andet sted der har syet det tøj vi har på kroppen osv. De får håndører for at lave det der. Det er jo nærmest bare mad og hus. Det fik slaver jo også. Det er ikke fordi de lever en meget andeledes tilværelse.

JU: Ja hvad er det egentlig vi skal og med ekstra hjælp? Hvad er det vi skal bruge vores tid på?

JA: Men man kunne måske bruge det til de demente lige som de der sæler (Paro), kæledyr. Kan de ikke hjælpe nogle mennesker der på en eller anden måde.

TH: Men hvorfor skal dens øjne lige se ud på den måde osv.?

JU: Men det er jo for at den skal stimulere nogle instinkter hos den gamle, så sælen skal være blød og de skal føle nærvær med nogle hvor det ikke gør noget de er glemsomme og glemmer den 3 dage på toilettet.

JO: Så kan det jo godt være det ville være smart at have en menneskelig robot hvis den skal varetage nogen.

TH: Men stadigvæk er det også nogle virkelig demente mennesker ik? Så er det mennesker der..

JA: Men dem er der også mange af er der ikke?

TH: Men jo helt sikkert. Det kan der sgu nok godt være et marked for. Men sådan generelt i hjemmet.

JU: Men nu er det også fordi du sagde om vi ville lære noget om os selv hvis robotter lignede os, men bare ikke behøvede løn bare skulle have strøm i stedet for mad. Det er bare det jeg ikke er så sikker på.

NI: Nej vi ville få mere tid til vores børn hvis vi havde færre hjælpe midler ik? Jo flere hjælpermidler du får jo mere prioritere du bare tiden til at være på arbejde eller lave alt muligt andet end at være sammen med familien.

TH: Og det ville hele tiden gå i stykker og repareret.

JU: men hvad ville der ske hvis man havde en robot der lignede et menneske og man talte grimt til den fordi det var jo bare en robot?

NI: Det var da min første tanke den gang hende der vågnede hvordan kan man fucke den der allermest op. Lave en ubehøvlet robot. Lige som man lærer sine børn at bande.

Me: Lige som det vi gjorde med Siri i dag (Asked her inappropriate questions).

NI: Ja det er det første man spørger Siri om når man får en ny telefon det er da alt muligt åndssvagt. Hvor langt ud kan man kører det. (Thinks it is funny)

JU: Hvad sker der så når man ikke behøver opfører sig ordenligt overfor sin robot? Så ser ens barn det og man vender sig selv til det. Så er de pludselig nogle ting der skrider når man ikke er ens.

Me: Hvad sker der når robotter kan simulere at græde og blive bange?

JU: Ja det skal den så kunne for at man opfører sig ordenligt. Så den kan give en reaktion tilbage.

NI: Så vil jeg have en ny (jokingly)

---------- Neato Commercial ----------

Me: Når men nu har vi lige set den her fremtidsfilm. Så tager vi lige et sidste klip her. Det er så fra 2013 sidste år.

(Clip playing – 49:04-50:47)

JU: Nårh, den var da meget sød.

JA: Kan man købe sådan en der?? (Surprised)

Me: Ja den kan man købe lige nu og her.

(Laughter)

Me: Hvad tænker i om dette her produkt som er hverdag nu for rimelig mange mennesker? Det har sådan nærmest ramt massemarkedet. Måske ikke lige denne her model, men robotstøvsugere i det hele taget bliver masseproduceret nu.

JU: Mmm. Det var da smart.

Me: Hvordan er den fremstillet? Kan i sætte jer ind i det? Ligesom I snakkede om de der fremtids menneskerobotter der var lidt creepy eller hvad var det I sagde.

JU & JA: Nej den var ikke creepy.

NI: Jo den gør noget af sig selv, men den gør noget prædefineret. Den scanner rummet, men ikke mere end det.

JO: Hvis man kigger på hvad de lagde op til. De gav den sådan nogle tillægsord så det virkede som om at den var en del af hele huset ikke? Altså de prøvede at fortælle at den passede ind og havde samme holdning til tingene som vi måske havde.

JU: Tror I ikke hundene bider i den?

JA: Men man skal også have et meget stilrent hjem ikke for at den overhovedet virker. Altså hvis man har en masse ting stående rundt på gulvet.

Me: Gider I have sådan en?

NI: ja.

JA: ja.

JU: Mhmm…

TH: Jeg tror ikke jeg gad at have den.

NI: Men den har bare fået programmeret at den kan opfatte der er en trappe. Jeg ser det ikke som noget intelligens. Jeg ser det bare som noget den har fået af vide at når du ikke kan se noget ned så skal du ikke køre derhen. Jeg ser det ikke som noget – ej, hvor er den klog. Og jo jeg tror hunden bider i den. Men den bliver helt sikker branded på at du får en lille rengøringskone.

JO: men hvordan kommer den op på hylderne osv.? Der er jo mange andre stedet en gulvet at gøre rent.

JA: Men hvis man kører den ofte nok så når det jo ikke at samle sig. Hvis man lige lader den køre hver dag når man er på arbejde.

TH: Jeg kan lidt bedre lide The Fifth Element hvor de gik ind i væggen. Jeg synes det er sindssygt grimt at have sådan en stående.

NI: ja den skal have meget plads.

TH: Så skal man lige pludselig have alt muligt bygget ind for at den kan gemmes væk. Man gider ikke at skulle se på den.

NI: Men det er måske også en ret dyr løsning at have noget gemt ind i væggen.

JU: Den kunne jo være under skabet.

JA: Eller inde i skabet.

TH: så skal den alligevel være så intelligent at den lige kan åbne en låge.

NI: Inde under en kommode eller…

TH: Eller inde under sengen. Så kunne den bor der.

JA: Creepy.

(Laughter)

JU: Ville du gerne have at vi sagde den var uhyggelig?

Me: Nej jeg vil ikke have I siger noget bestemt. Jeg skal jo bare høre hvad I siger.

JO: Men hvad ville du selv gøre Kasper?

Me: Jo vi er jo sådan set ved vejs ende.

NI: Var ret imponeret over den kunne køre over tæpper og dørtrin. Jeg troede man ikke kunne have disse ting. Den har højden til det.

Me: Spørgsmålet er hvordan denne her ser ud om 5-10 år ikke.

---------- After talk 55::00 ----------

Me: Lige til slut. Hvordan tror I det ser ud om 10 år med de her ting? Det bliver nok ikke helt som i Äkta Maniskor, men…

NI: Altså om 10 år er de der meget billigere. Så kan du få en i Netto for 499,- alle har en.

Me: Men er verden overtaget af robotter om 10-20 år?

NI: Nej. Det bliver den aldrig.

TH: Jeg tror også der er nogle andre ting. Hvis jeg havde sådan en støvsuger så ville folk tænke jeg var doven.

JU: Også spørgsmål om mode og signaler man sender.

TH: Der er også alt det med vedligeholdelse. Der er alle mulige smarte juicepressere, men så er der alt muligt rengøringsarbejde hver gang man har brugt den. Men vil man signalere at man har alt det der og ikke rør en finger selv?

NI: Men det er også spørgsmålet om 10 år, fordi tror du ikke sådan noget? Altså folk der fik vaskemaskine/opvaskemaskine. Hun er også doven. Altså nu er det hverdag. Alle har en opvaskemaskine. Om 10-15 år så er det bare normalt at alle har en robotstøvsuger.

TH: Men det er bare lige graden af det. For til sidst kan vi jo bare selv ligge i sengen lige som alle de der andre film og så gøre ikke en skid og alle robotterne gør alt for os. Og det gider vi jo ikke tror jeg.

NI: De fleste vil ikke.

TH: nej så der er en eller anden grænse for hvor det er for meget.

NI: Men det er også på det punkt hvor at biler kan bremse og parkere og alt sådan noget selv. Det afhænger bare af magnetstriber i vejbanerne for at de kan køre selv.

TH: Jeg tror at grænse går lige der til hvor at mennesket stadig føler at det er dem der styrer. Lige så snart at der er for meget der styrer så er grænsen overskredet.

NI: Men hvis du havde fortalt folk 10 år før metroen kom at der ville køre toge rundt uden føre i så ville folk jo heller ikke tro på dette. Ville man så ikke sige ja til at om 20 år så kører bilerne af sig selv?

(Traffic talk)

JU: Der bliver sådan et skel mellem at man stadig skal føle at man har… At man selv dyrker grøntsager og man har tomatplanter i sit vindue, men det er ok at have en robotstøvsuger fordi det er det kedelige og det er ok at have hjælp til at parallelparkere. Måske også køre bil for det er også kedeligt. Så der må ligge et eller andet hvor identiteten ligger. At det ligger mere i mad end i støvsugning.

NI: den måtte jo egentlig godt varme lasagnen i oven, men den skal ikke stege mine dyre bøffer. Den må godt gøre det lidt kedelige, men den må ikke gøre det der hvor det er lidt sjovt.

10 Appendix II

Housewives or Technophiles? Understanding domestic robot owners. (Sung, Grinter & Christensen 2008)

Findings:

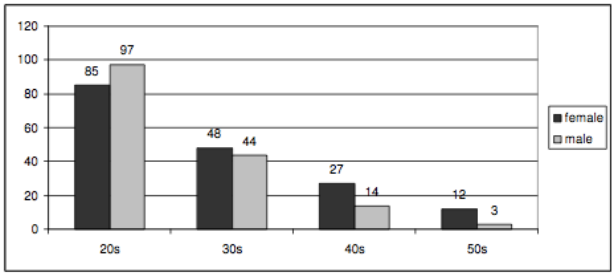

Figure 1. Age and Gender Distribution

Table 1. Motivation for first Roomba ownership

Purchase motivation for First Roomba (N=379)	responses
Through my or other's experience (demonstrated, recommended, gifted)	188
Interested in new technology	173
Hate vacuuming	171
Curiosity	152
Always wanted to own robots (childhood dream)	79
Overwhelming amount of cleaning. Need assistance	63
To workaround physical difficulties	44

Table 2. Motivation for the subsequent Roomba purchase

Purchase motivation for subsequent Roomba (N=71)	# of responses
It was a gift	24
Loved the first one very much and wanted more.	24
Need to clean different parts of the home.	20
Wanted one for cleaning and the other for hacking.	16
My first one broke so purchase another. Then, I fixed my first one and hence owned multiple.	13

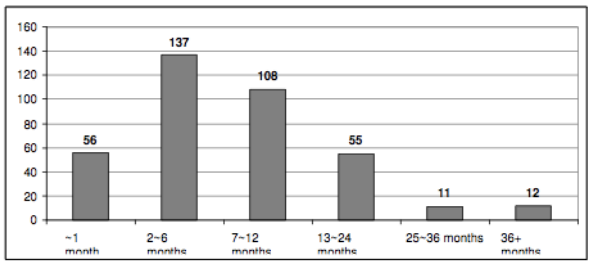

Figure 2. Length of ownership since the first Roomba

Table 3. Frequency of cleaning before/after Roomba usage

	Before Roomba	With Roomba
Cleaning frequency	*# of responses*	*# of responses*
Every day	22	37
Every other day	54	75
Weekly	159	168
Bi-weekly	70	46
Monthly or less	46	22

Table 4. Frequency of extra manual vacuuming

Extra manual vacuuming?	# of responses
Yes, always.	45
Yes, occasionally.	136
Yes, but rarely.	58
No, never.	135

Table 5. Non-Cleaning Roomba Activities

Activity Type	# of responses
Watch Roomba running for fun	276
Give a demonstration to others	217
Play and experiment	141
Ascribe a gender to Roomba	135
Name Roomba	87
Ascribe a personality to Roomba	44
Talk to Roomba (praise, greet)	42
Buy costume (dress up)	43
Hack the internal system	21

Table 6. Additional robots owned by Roomba users

Types of Robots	# of Units
Scooba™ (mopping)	37
Robomower™ (lawn mowing)	47
Dirt Dog™ (garage cleaning)	27
AIBO™ (toy dog)	25
Dressman™ (ironing)	11
Paro™ (nursing)	13
Other robotic vacuum cleaners	3
Humanoid robot toys (i.e., Robosapien)	62

Table 7. Total number of other robots owned beside Roomba

# of robots	1 robot	2 robot	3 robot	4 robot	5 robot	6 robot	7 robot
# of owner	132	20	6	3	2	1	1

11 Appendix III

TABLE 1
EXAMPLES OF TASKS UNDER TIME-CONSUMING DRUDGERIES

Cleaning	Vacuum (n=6), wash dishes (n=9), laundry (n=7), clean tub (n=4)
Yard Work	gardening (n=7), watering plant (n=3)
Cooking	cook (n=12), food preparation (n=5)

TABLE 2
EXAMPLES OF TASKS UNDER HOUSE-SITTING

Hygiene & Health Inspection	health diagnosis (n=3), germ control (n=3)
Resource Management	inventory cataloguing (n=6), temperature & light control (n=3)
Security Control	property security (n=7), answer door (n=3), bodyguard (n=2)

TABLE 3
EXAMPLES OF TASKS UNDER PERSONAL ATTENDANCE

INTELLECTUAL SUPPORT	
Organizer	report news (n=7), scheduling (n=3)
Instructor	financial help (n=2), fitness trainer (n=3)
EMOTIONAL SUPPORT	
Beauty Support	hair & make-up (n=6)
Mind Relaxation	massage (n=6), refreshments (n=5)
Entertainment	play movie & music (n=3)

12 Appendix IV

Hey X!

Min opgave handler om markedsføring af de næste generationer af intelligente mobile robotter til hjemmet. Den eneste af den slags, der findes i dag er robotstøvsugeren.

Du skal tegne en intelligent mobil robot du godt kunne forestille dig at have i dit hjem i fremtiden og som kan noget du ville værdsætte. Den kan sagtens være meget mere avanceret end robotstøvsugeren, bare det ikke bliver helt wacked at den er usynlig og kan gå igennem vægge.
Den kan lave alt hvad det skulle være i hjemmet. F.eks. rengøring, sikkerhed, underholdning, personlig pleje, helbred, madlavning eller noget helt andet du finder nyttigt.

Den behøver selvfølgelig ikke være tegnet super professionelt, bare det er tydeligt hvad den kan, hvordan den opererer, hvordan man kommunikere med den og dens udformning og design/finish i det hele taget. Altså størrelse, farve, nogle bestemte materialer. Hvad skal der til for at den rent æstetisk ville være acceptabel eller måske ligefrem cool/smuk at have derhjemme? Eller er det vigtigt den er meget neutral eller kan gemmes væk?

Brug også omkring en kvart til en halv A4 siden på at beskrive robotten i ord som supplement til din tegning. Skriv gerne forklarende tekster på tegningen hvis det gør det nemmere at forstå hvad du mener.

Når du har lavet det så tag et billede af tegningen og send det hele til kasper.s.birkelund@gmail.com. Jeg regner med at ringe rundt og interviewe lørdag og søndag!

13 Appendix V

Gitte, 54 – Massage robot

Massagerobotten skal fremstilles som to arme med hænder i fuld menneskestørrelse. Robotten udstyres med et kontrolsystem som koordinerer bevægelserne i de mange led. Der skal være tryksensorer som mærker det tryk som er mellem robotfingrene og det den masserer.

Hænderne er programmeret til flere forskellige bevægelsesmønstre.

Robothænderne har yderst en "handske" lavet af et materiale som føles nøjagtig som menneskehud. Huden har samme temperatur som menneskehud og huden er sensitiv, så robotten kan føle. Computeren skal være stemmestyret, så man ved tale kan ændre trykstyrken og bevæge hænderne i alle retninger.

Når Robotten ikke masserer kører armene ind i en beholder som er rund diameter 35 cm og 50 cm i højden med hjul under. Rød med sorte hjul. Robothænderne skal være samme røde farve.

Den skal stå i hjørnet i stuen.

Når jeg kalder, kommer Robotten trillende, den sænker sig ned over hjulene suger sig fast til gulvet, og kører armene ud.

Jeg sætter eller lægger mig på gulvet, og taler robotten i gang.

Ideen er, at robotten skal føles nøjagtig, som var det menneske hænder der masserer.

Ken, 31 – Home assist robot

Assisting with dexterity.

The "screen head" allows for the user to interact with the robot through speech or touch screen, speakers on either side of the head.

At the back of the robot a dish-washer is mounted as one of its features of assisting. It will be able to place the dishes back to storage once cleaned.

The robots base is installed with three functions:

- Brushes for floor cleaning.
- Vacuum cleaner
- Lawn mower

Integrated into the screen head is software that links the robot to a smart-grid where the robot will figure out when it is cheap to recharge its batteries.

It will also assist with energy savings around the house in general.

Small design

No bigger than a regular bucket. The home assist is pragmatically sensible in that it is able to execute the duties fount to be bothersome. The backpack gives it a childlike look making it as unintimidating as possible.

Niels, 25 – Robot helper

Min opfattelse af en robot til hjemmet er en robot der vil lette opgaver i hverdagen og hjælpe med at huske ting for mig. Den vil som det absolut vigtigste varetage støvsugning og gulvvask. Dernæst ville det være en hjælp for mig, hvis den var synkroniseret med min iCal og den derfor ville kunne vække mig om morgenen, tænde for lyset i soveværelset samt tænde for radio/morgen tv. I samme omgang skulle den kværne friske bønner og brygge en kop god morgenkaffe samt dosere og servere mine morgenvitaminer.

Features:

- Støvsuger + skuffe til støvpose. Censor der kan registrere hårdt gulv eller tæppe og dermed automatisk bruge børste.
- Gulvvask + skuffe til vand og sæbe.
- Skuffe til medicin/vitaminer.
- Kaffemaskine (kværn + brygger + kopdispenser)
- Beholdere til bønner, the og vand.
- Touch skærm
- Software der kan synkroniseres med iOS eller Android
    - Kalender
    - Browser
    - Radio
    - Styring gennem tlf.
    - Osv.

Design:

Hvid plastik, neutrale farver. Mørkegrå. Hård plast. Ikke dominerende design. Den skal bare være der. 1 meter ca.

Signe, 31 – Robotkæledyr

Jeg elsker dyr, men synes det er synd at have en kat i en lille lejlighed som min fx.

Kunne være hyggeligt med et robotkæledyr som var 100% livagtigt i sin opførsel og bevægelser, men ikke fældede pels og skulle have mad og drikke.

Fx en babytiger som aldrig blev større.

Funktioner:

- Være kælen
- Ikke svine
- Man skal kunne lære den at lege og lave tricks
- Alle de gode ting fra et kæledyr, men ingen af de dårlige
- Have sin egen personlighed

Design:

- Den skal ligne og føles som et rigtigt dyr
- Ikke så stor
- Nuttet

Jonas, 28 – Mouth washer

Motivationen for denne robot kommer primært af to scenarier:

1. I takt med at vi bliver ældre skal vores tænder holde i stadig flere år. Derfor er det et problem, hvis man ikke sørger for at få børste sine tænder grundigt og gerne 2 gange dagligt lyder anbefalingen fra tandlæger. Samtidig er det mest effektive redskab til dato den elektriske tandbørste, som gør arbejdet grundigere. Men den halvautomatiske børste hjælper ikke meget når man ikke giiiider børste sine tænder og bare vil i seng.

2. Alle kender situationen. Man er i byen, ude med venner eller en sød pige, og den lækre tapas middag bliver hurtigt skyllet ned med rigelige mængder af rødvin. Problemer opstår efterfølgende når man sidder med diverse pølser og andet, samt blå tænder fra rødvinen.

Robotten

The Mouth Washer er en nano-robot, altså en lille robot der stort set kan betragtes som en del af os. Den bor inden i munden bag en tand, når den ikke er i færd med at børste vores tænder. Når man har behov for det beder man den om at børste tænderne, hvorefter den kravler rundt i munden og sørger for at komme rundt i alle afkroge. Den kan betragtes som en mellemting mellem en edderkop og en tandbørste. Det er vigtigt at det ikke er ubehageligt når den bevæger sig rundt i munden, og i princippet skal man kunne foretage sig andet imens.

14 Appendix VI

Gitte, 54 – Massage robot

Funktionen

Hvad er den primære grund til at du gerne vil have denne her massagerobot i dit hjem?

massage hver dag. Fordi du spiller tennis. og slippe for indfiltretioner go hovedpine.

For at undgå at bede ham om det.

mogens irriteret.

Konflikter.

Spild aft id.

Ikke noget han har lyst til.

Spare dig selv for at han bliver irriteret.

Gider ikke at have det dårligt over at bede ham om noget han ikke har lyst til.

Go det bliver du også selv irriteret over.

Designet

Snak kort om det.

Hvorfor har du valgt at den skal se ud på den måde?

Størrelse fordi minimum for at hænder kan være der.

Synlig på god go glad måde. Ikke in di skab.

Hyggeligt. Lige som fitness.

Minder dig om noget godt.

Kommer i tanke om at man lige kan kalde på den.

god følelse i sin krop af velvære.

Hænder naturlige. Men skal ikke ligne et rigtigt menneske.

Ikke bryde mig om at have en menneskerobot i mit hus.

Gladere af at det er en maskine. Fræk ud i farverne.

Skræmmende med et rigtigt menneske.

Uvandt.

Ken, 31 – Home assist robot

Funktionen

Hvad er den primære grund til at du gerne vil have denne her Home assist robot i dit hjem?

Give me more time to do other things. Be with family. Burden of doing the house work. More time reading. Developling my self.

I don't like to do housework.

Make you feel better. Spend time with kid wife.

Get to know them even more. More shared interests.

Develop talents for Carlo.

All one life to life. More time on things we enjoy to do.

Making me a happier person to be with.

Social animal.

Realize your self.

Designet

Snak kort om det.

Hvorfor har du valgt at den skal se ud på den måde?

Kids around it. Entertaining. cute.

Smaller than them they wont feel intimidated.

Part of the family. Maybe have a name.

Not disruptive. Seeminly.

Good. Another extension of the team.

Responsibility for the robot.

Protector.

Niels, 25 – Robot helper

Funktionen

Hvad er den primære grund til at du gerne vil have denne her robot i dit hjem?

Bekvemmelighed. Ting man ikke selv gider. Nemt hvis det blev gjort.

Bruge korte tid en man selv vill bruge.

Spare tid. Bruge tiden på noget man synes er sjovere eller vigtigere.

Tjene flere penge. Spare penge på rengøring. Sammen med familie go venner.

Byttemidel til oplevelser go ting.

Livskvalitet.

Fam:

Det vigtigste.

Det bliver man glad af.

Udfører et fysisk arbejde. Så jeg kan realisere dig selv.

Designet

Snak kort om det.

Hvorfor har du valgt at den skal se ud på den måde?

God størrelse. Ikke forskrækket af den hvis man skal på toilettet.

Ikke fylde for meget. Fluen på væggen.

Det er en død ting.

Ikke til besvær.

Ikke mere end højest nødvendigt.

Ikke kæledyr.

personlighedstræk ikke godt.

Ikke sige goddag.

Kunstigt. Det har jeg købt den til at gøre.

Ikke socialt behov.

Ligegyldighed.

Signe, 31 – Robotkæledyr

Funktionen

Hvad er den primære grund til at du gerne vil have denne her robot i dit hjem?

Det kunne være hyggeligt

sjovt at have sådan en rendende rundt

Det kunne være en form for underholdning i stedet for at se fjernesyn

Det er spild af tid at se TV

Bedre at lave noget hvor man er lidt mere tilstede i tilværelsen.

Den kunne blive lidt et projekt lige som et rigtigt kæledyr. At lære den ting

Man bliver glad fordi man har opnået noget.

Så føler man at man er lidt mere end en sofakartoffel.

Jeg vil godt være sund og rask

Så jeg kan lave nogle fede ting med mine venner og familie

Designet

Snak kort om det.

Hvorfor har du valgt at den skal se ud på den måde?

Vigtigt den er nuttet selvfølgelig og helt livagtigt

Skal ikke virke som om man har en maskine

Det ville være mærkeligt at føle man havde noget med en maskine

Det ville være underligt

Så ville jeg tro der var noget galt med mig hvis jeg var så desperat

Den skal bidrage med noget rigtig liv til lejligheden

Sjove oplevelser med robotten

Ikke være alene

Jonas, 28 – Mouth washer

Funktionen

Hvad er den primære grund til at du gerne vil have denne her robot i din mund?

Så jeg slipper for at børste tænder

Og man glemmer det aldrig

Tit gider man heller ikke rigtig hvis man er træt

Men det er også rart at have rene tænder

Tænderne er vigtige

Men har altid sunde tænder og god ånde

Vigtigt man ikke skræmmer folk væk

Designet

Snak kort om det.

Hvorfor har du valgt at den skal se ud på den måde?

Det er vigtigt at den er så lille så man ikke lægger mærke til den og den kan bo inde i munden

Så er den der bare altid og man kan koncentrerer sig om andre ting

Så kan man spare noget tid og nogle bekymringer

Så kan man bruge sin tid på nogle vigtigere ting her i livet