The Laundry Buddy, A Future Perspective

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Abstract
Smart homes are becoming the future standard of living: a home full of connected devices, intended to save time and make life easier. However, the technological revolution in the past century teaches us that most of technological developments come with side effects. Often, the "saved" time fills up with new tasks. This paper investigates three future perspectives about the practice of doing laundry in an everyday context.

Introduction
Technology shapes our everyday life in many ways. The spaces we inhabit, the tools and items we use, and the way we interact with each other rely on the available technology.

We create and change daily practices by incorporating functionalities that new technologies offer. Both new and existing technologies allow us to live vastly different lifestyles than the generations before us. But what specific kind of change does technology bring to our households?

Households have gone through major changes over the last century. The industrial revolution of the home did not only transform household devices and electronics, but the social structure of households as well (Cowan, 1976).

The adaption of household technologies from the 1910's to the 1960's correlated with the emergence of the nuclear family, as unwed women of the family and paid household workers disappeared (Forty, 1986). Whereas the housewife previously delegated household tasks to other women in the home, she became primarily responsible for doing housework.

Figure 1 Washing machine advertisement 1952 (Lowbrow, 2017)

Advertisements at the time promised these new technologies would save time and effort (Gann, Barlow, & Venables, 1999; Sparke, 1987), but also showed the

increasing social pressure on the housewife to adopt such devices and and excel in using them.

Figure 2 Kitchen Appliances advertisement 1952 (Lowbrow, 2017)

One could expect that these technologies did help the housewife to manage household labor on her own. For instance, the task of doing laundry: instead of endless scrubbing she could simply start the machine and wait until the clothes were clean.

The research of R. S. Cowan suggests a trend that those household technologies did not necessarily save time or make everyday life easier (Cowan, 1976). It seems that old tasks were simply replaced with new ones, because our demands and practices changed with the wide adoption of these new technologies.

After the wide adoption of the washing machine, clothes were expected to be washed more often (Zmroczek, 1992). Time the housewife might have saved would now be taken up by washing multiple loads of laundry (Cowan, 1976, 1986). This could perhaps cost more effort and time than before.

Figure 3 Samsung smart washing machine (Youtube, n.d.)

Nowadays people are becoming more connected to each other with the adoption of smart devices. Society is starting to embrace smart homes (Barlow & Venables, 2003) and smart products that are currently promoted with a promise of convenience, similar to the promises these technologies of the past made.

The future perspective

Smart devices provide the value of convenience through the existence of many connected agents that are constantly collecting and sharing information. People are constantly connected to their devices and each other. Although there is autonomous communication between devices for automation, a lot of information is directly or indirectly exchanged with the users.

Figure 4 Smart home scenario (Lowe's, n.d.)

In extension of this, new norms and demands could emerge about how much people should be connected and how much information they share and receive.

This paper tries to illustrate a potential future scenario of doing laundry centered around the following question:

What if your washing machine communicates with you with the intent of adding value to your laundry routine?

Design

Our envisioned future scenario requires the presence of many smart devices and interacting agents. For the purpose of practicality we therefore created three future scenarios: 'the near future', 'the future', and 'the far future' (further explained in Methods). An artifact was created for deployment in 'the near future', where the presence of many agents is not yet the norm. This allowed us to conduct field research in a context similar to the scenario.

Our prototype was based on the principles of the paper "From research Prototype to Research Product" (Odom et al., 2016). Laundry Buddy acts as a communication tool between the user and the washing machine.

Inquiry driven

The research prototype/system was designed to ask the question: What if your washing machine adds value to your laundry routine by communication? The prototype does exactly this without interfering with the routine of the user.

Finish

Laundry buddy is designed as a personal device that should perfectly blend in with the laundry routine. Therefore, we chose to create a design with an own personality. Laundry buddy has animal like shapes and was painted a soft blue color, which is perceived as a cute feeling.

Fit

The cute personal laundry buddy is designed such that it can perfectly blend in with the daily laundry routine. The design can be placed on top of the washing machine, where it does not disturb the user. The connection with the smartphone was easily made over WiFi and therefore did not ask the users to need other actions then needed for doing the laundry

The Communication

The Laundry Buddy sends information about:

When the wash machine starts

When the laundry is done

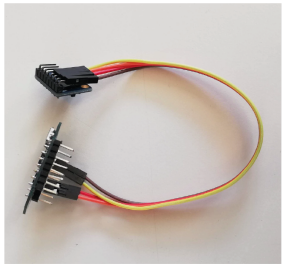
Random advertisement related to the laundry

R**andom tips** about how users could improve their laundry routine

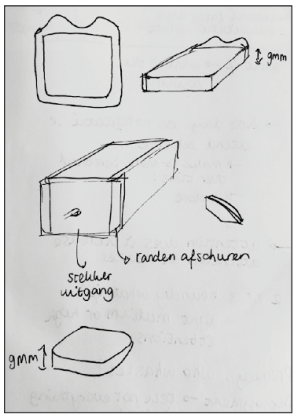
When t**he wash machine has finished 10 minutes ago**, suggest that they still might need to take out the laundry.

A reminder to do the laundry

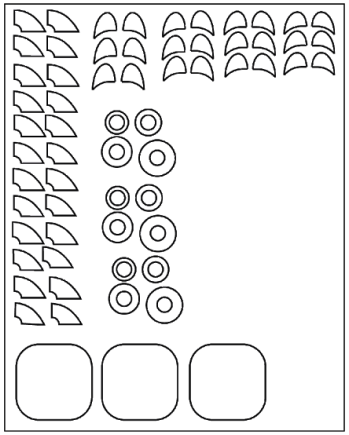
The Laundry Buddy



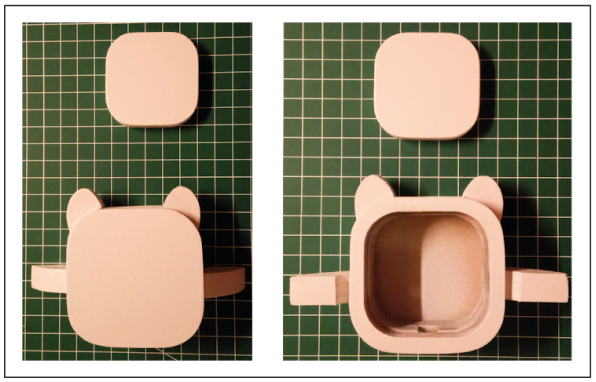
The Process



Sketching:
Drawing out the measurements and designing the buddy



Lasercutting the parts



Bringing it together

Independant
When the design is installed it can work completely independent of other devices. It sends the data via his own created WiFi station and works immediately when plugged in.

This cute personal communication tool can be placed on the washing machine. A accelerometer senses the vibrations of the washing machine and determines if the washing machine is used. It communicates information from the washing machine about the laundry to the user. Several kind of messages are sent to the smartphone of the user; Laundry start, laundry done, Tips, advertisements and reminders.

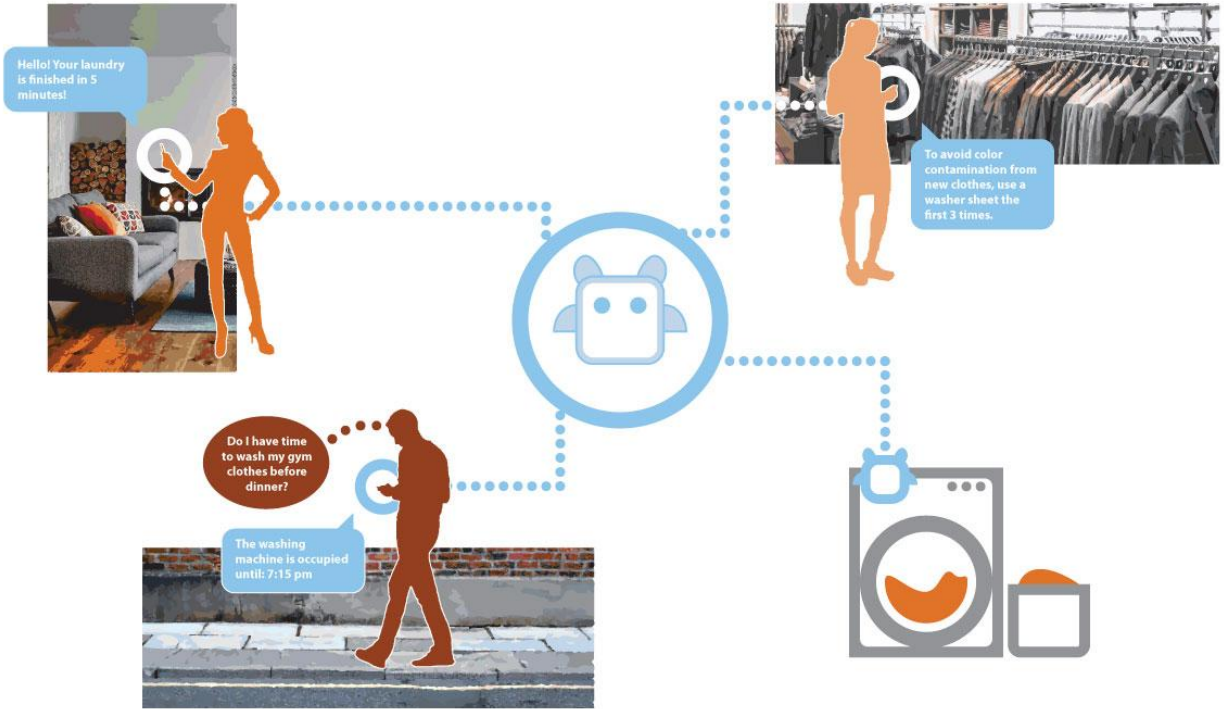


Figure 5 'The near future'

Figure 6 The deployment setup

Method

'The near future'

We deployed the design of laundry buddy in the near future phase. A combination between Field research (Millen, 2000) and an auto-piloting test (Méndez, 2013) was used because this was most suitable for our research. Field research has the advantage of testing a prototype in the real daily routine of an user.

We tested the research prototype in one household for a week, with 3 participants. Laundry buddy was installed on top of the washing machine of the household (see picture 6). On the smartphones of the participants an app was installed that received the information from the laundry buddy.

The participants were asked to use the laundry buddy for a week and see how they would experience the communication between the washing machine and their phone. After the one week they were asked to fill in a questionnaire and there was a small open semi-structured interview. The questionnaire was based on the SUS usability scale (Brooke, 1995).

Because of the time limit, we conducted an auto-piloting test alongside this user test. The researcher, who was part of the household, as an expert, wrote down his experiences during the week but also the reactions of the other participants during the day.

Figure 7 a scenario of 'The future'

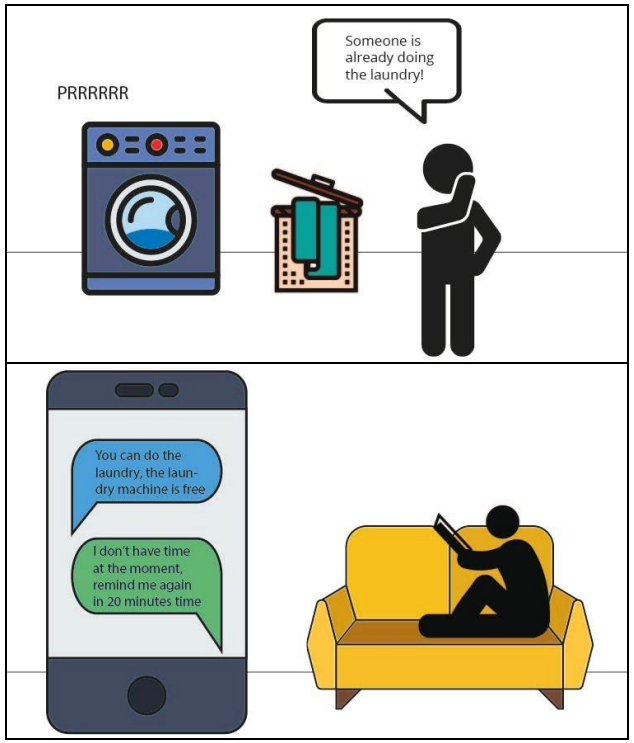
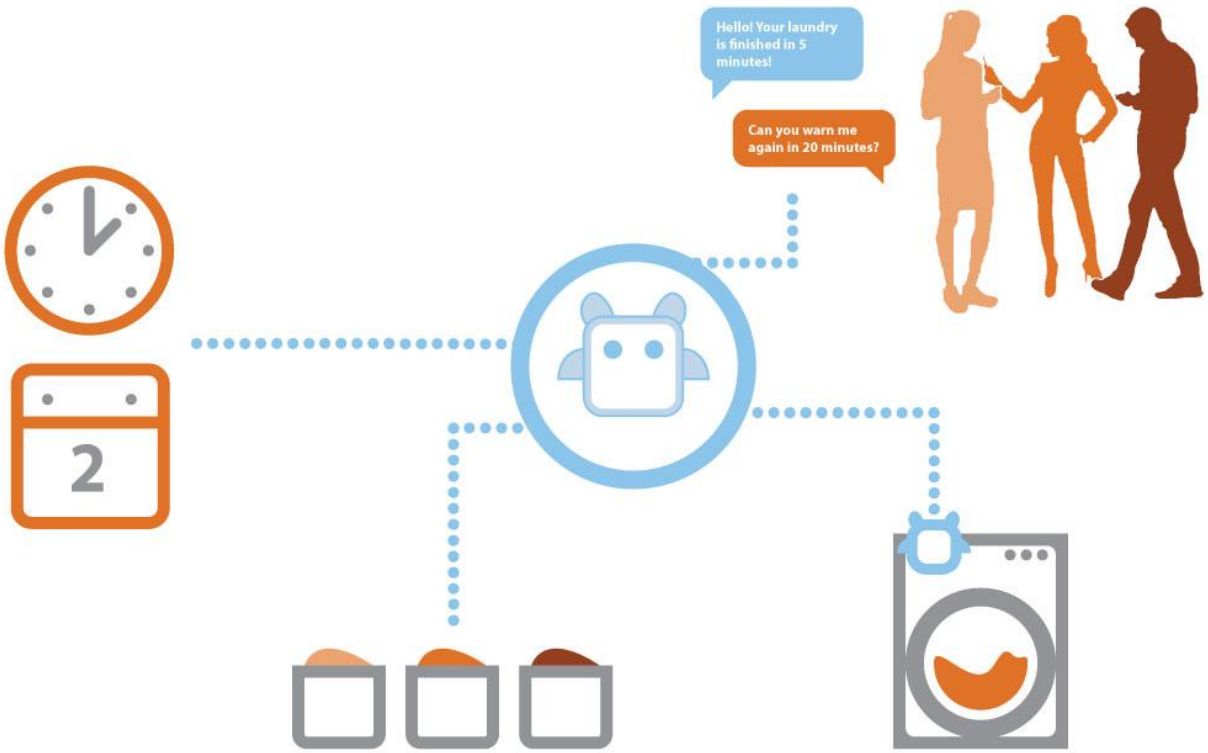


Figure 8 'The future'



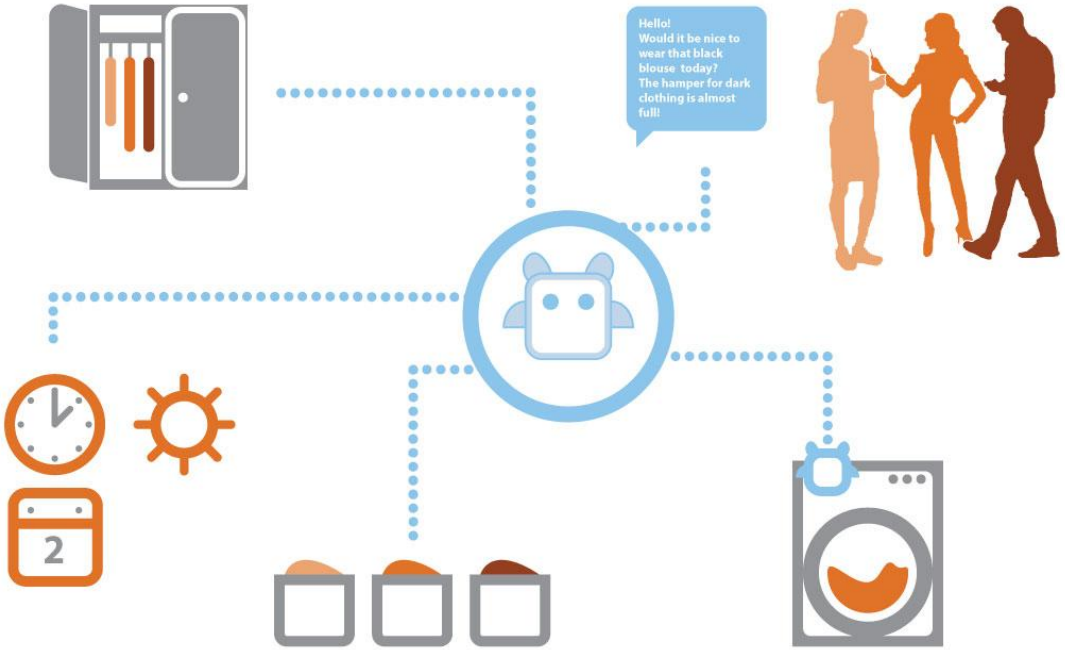
"The future'

We extended the Laundry Buddy concept for the future perspective. The Laundry buddy is also integrated with other features related to the washing machine. It has insights in your personal schedule and your laundry basket, and knows when you have some spare time to do the laundry. It has never been more easy to do the laundry, since your buddy helps you.

Figure 7 shows a scenario of a household with multiple people that use one washing machine. The Laundry Buddy sends notifications, wherein the user is able to communicate back to the system.

A semi-structured interview was conducted with four participants. They were asked about notifications, the role of smartphones, and the increase of technology in their daily life. Different scenarios about the laundry system were presented to the participants.

Figure 9 'The far future'



'The far future'
Extending this further, the Laundry Buddy becomes completely integrated with your smart home and other smart devices. It communicates with your washing machine, laundry bin, and closet to know which clothes are clean or dirty. Besides integrating with your schedule, it also knows the weather forecast.

In figure 10 a scenario is shown where a person questions where their sweater is, and is quickly able to determine its location on their phone.

Although this type of scenario is not exclusive to households with a shared washing machine, the other functionalities of Laundry Buddy are specifically suited for such households.

Three participants were questioned in a more structured interview of the same content as the 'future' scenario, but introduced the scenario after a series of questions about receiving notifications, the role of smart products, and information they would like to receive. They were then asked questions about the scenario itself.

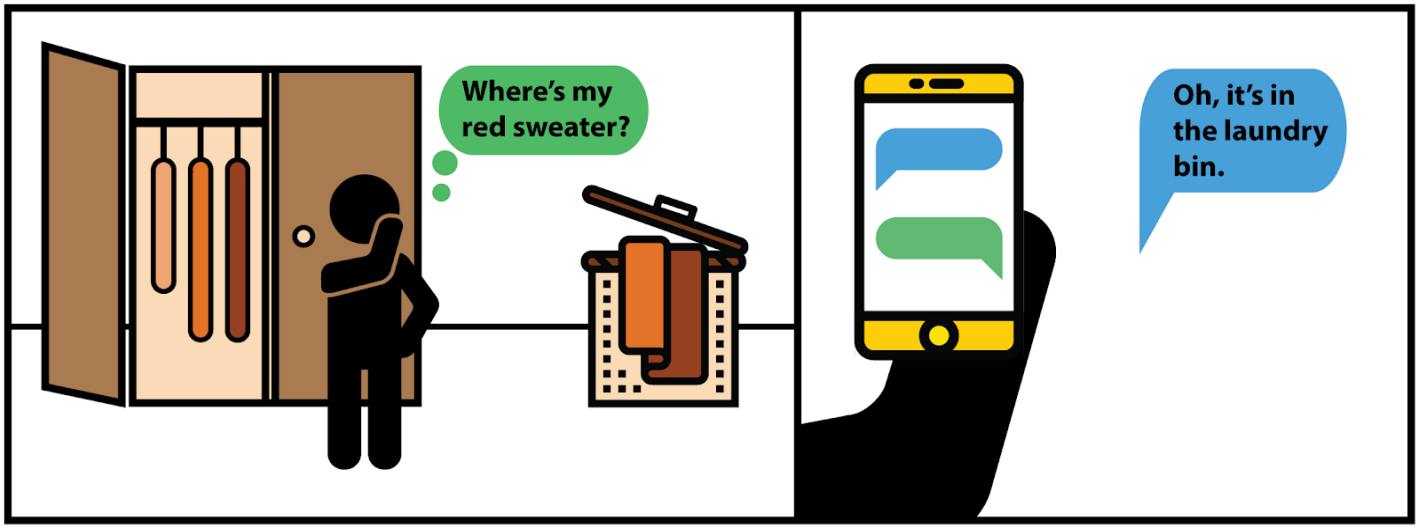


Figure 10 a scenario of 'The far future'

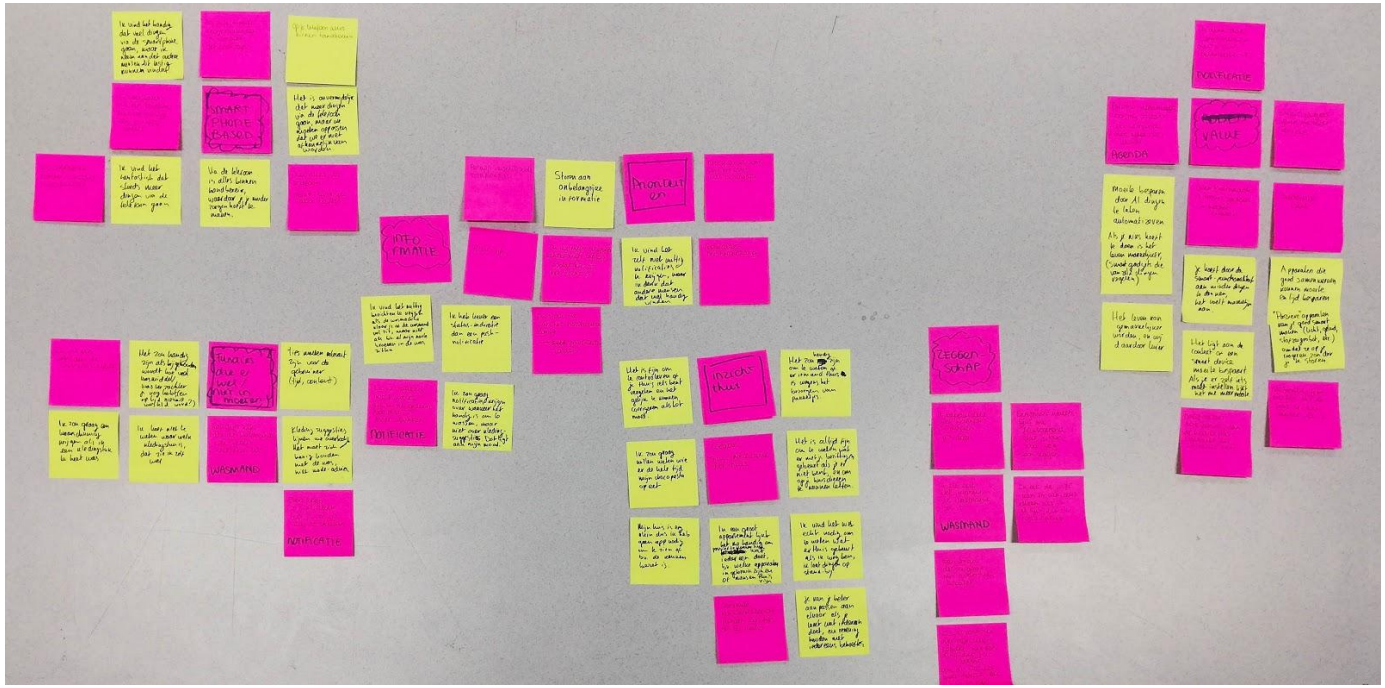


Figure 11 Thematic Data Analysis

Data analysis

In order to answer our research question, we did a Thematic Data analysis (Braun, Clarke, Braun, & Clarke, 2008) of the semi-structured interviews, questionnaires and expert view, several themes came forward (the raw data can be found in the Appendix). Most noticeably are described in this section.

Personal Agency

The first theme is Personal Agency: the ownership of your own life and choices. The results showed that a lot of participants will only allow a certain amount of control. Quotes like '*I will decide that for myself*' for a scenario where the washing machine would mention that it was time to do the laundry, showed that the decision making process can be see as of personal value. Another example is the quote:

"I like to keep a bit of control over my life without some device taking over. Although it takes more effort, it's how I prefer to interact with my environment. I'm also afraid that if you lose that task, you would lose the attention of your environment, because a system will take care of that.'

Some of the participants state that they don't want to become depended from smart gadgets. While other participants appreciate the change of the increase of technology in their daily life. The product that we proposed in this research is based on the use of a smartphone application.

Smartphone Based Device Control
The smartphone has big influence on our everyday life. We have chosen to use the smartphone as a communication tool for the device that we have made and therefore interested in the role the smartphone could play in the future of the participants live. It seems that some participants are critical towards an even more increased role of their phone in their everyday life. *"It is inevitable that smartphones become more important and integrated in our lives, but we have to be careful not to become too dependent on them."*

While other participants appreciate the how many functions can be added and taken control of by one device. *"I find it very convenient since everything is in my reach, but I can imagine older people do not if they're bad with technology."*

The Product Value
The results show that the value proposition of the product is an important consideration in adopting the product in the daily life. One of the participants mentions the proposed added value, *'Devices that work well together can save time and effort.'*

While other participants state that is seems like an extra thing to think about during the day. One example is; *'Smart gadgets seem like a burden to me.'* The expert mentioned: *"Receiving a message when my mother starts doing the laundry was really useful. This way I could quickly grab my clothes that still needed to be clean."*

The tradeoff between added value and added care is one that the potential users of a smart homes need to make.

How to communicate information
The product that we have introduced as a solution for laundry management focuses on the communication between the device and the user. How the device communicated information was a centre discussion point during the interviews. The participants mentioned how they would like to be approached by the system. One example is the quote:

'I would rather like to notify myself. Then I would say: I want to do the laundry, and that I would then be able to see if the washing machine is available. And that I then would have the possibility to indicate that I want to receive a notification when the washing machine is free. But not a notification every time that the washing machine is free like now you have the chance to do your laundry!'

Desired information and functionality
Everyone has different priorities in what kind of information needs to be shared. The participants mentioned that notification can have different priority based on time, the type of message and the person(s) receiving it from. One of the participants gave an example of how the information could be shared in a different way: *"I would prefer a status indication over a push-notification".* The expert mentioned about the priorities: "It is very annoying to receive tips at random moments. I am working on school stuff and it completely disturbs my working flow.."

The type of information that is shared can change the functionality of the product. It seems to be a preference to only look up information when you need it, or to receive it passively (it's shown somewhere relevant but you're not alerted). Although the laundry buddy focuses on the time, tips, and advertisement, functions like sending warning and thereby changing behaviour can also be valuable. One example is, *'I would like to receive a notification when I'm about to wash a piece of clothing too hot.'*

Some say it's useful to have this much insight, others say it's unnecessary or redundant, which is in line with the differences in added value as discussed before.

Other interesting findings

From expert view:

"A power failure in the power grid stopped the washing machine and the prototype. However, the prototype was designed in such a way that it would come back online when the power came back. It is completely independent of other devices, so It worked immediately again."

"After a small week it became quite annoying to receive messages. Especially the tips and advertisements. You start to ignore the messages, which also can be a good thing if you do not need the message at that moment."

The results of the questionnaires showed a interesting combination of answers between two questions.

The participants both indicated that they find the system unnecessarily complex, however they would like to use this system frequently. One of the participants indicated that this was due to the current situations she was in, as our expert noted; *"My sister mentioned that she liked the experience but did not find it very useful in the current situation at home".*

Discussion

The four themes 'personal agency', 'added value', 'how to communicate' and 'what to communicate' could be interpreted as values to consider for designing in a future context.

The results of the theme 'personal agency' show that having personal control over the behaviour of smart systems and devices is very important to the user. In the future design of the laundry buddy, it would be important to support options for adjusting notification settings and features to personal preference.

In the broader context of smart devices, this could point to the desire of users to retain control of the information they receive and in what manner. 'What to communicate' and 'how to communicate' therefore largely depend on the amount of agency the user wishes to retain over their smart devices. To what point would it be practical and desirable for the user to control this?

As one of the participants mentioned: we cannot avoid the use of smartphones, but we should be careful about our reliance on them. It could be interesting to research alternative methods of (both one-sided and interactive) communication between the user and their smart devices, avoiding a system that is only dependent on smartphones.

The results also show a disagreement amongst users about the 'added value' that both Laundry Buddy and smart devices in general can offer. However, they also hint at a willingness to keep using such devices, despite not finding them useful.
This is in line with our future perspective: the amount of connectedness and information people desire increases with technology's ability to provide it.

Communication with the washing machine may be perceived as either adding or not adding value to users' laundry routine. However, by making communication possible, users express a desire to control the methods and contents of it.

Limitations

There are some limitations to our research. Firstly, our future scenario is an educated guess, influenced by our own perspective on the future. Because there are many possibilities of what everyday life could look like, doing research in this context is not as reliable as research in an existing context.

Furthermore, the research was only deployed to a small participant group. Further study with a greater amount of people could significantly (in)validate our findings.

References

Barlow, J., & Venables, T. (2003). *Smart Home, Dumb Suppliers? The Future of Smart Homes Markets*. https://doi.org/10.1007/1-85233-854-7_13

Braun, V., Clarke, V., Braun, V., & Clarke, V. (2008). Using thematic analysis in psychology Using thematic analysis in psychology, *887*(January), 37–41. https://doi.org/10.1191/1478088706qp063oa

Brooke, J. (1995). *SUS: A quick and dirty usability scale*. *Usability Eval. Ind.* (Vol. 189).

Cowan, R. S. (1976). The "Industrial Revolution" in the Home: Household Technology and Social Change in the 20th Century. *Technology and Culture*, *17*(1), 1. https://doi.org/10.2307/3103251

Cowan, R. S. (1986). Ruth Schwartz Cowan. More work for mother: The ironies of household technology from the open hearth to the microwave. *Journal of the History of the Behavioral Sciences*, *22*(1), 81–84. https://doi.org/10.1002/1520-6696(198601)22:1<81::AID-JHBS2300220113>3.0.CO;2-B

Forty, A. (1986). *Objects of desire : design and society since 1750*. Thames and Hudson. Retrieved from http://www.openbibart.fr/item/display/10068/958956

Gann, D., Barlow, J., & Venables, T. (1999). *Digital Futures: Making homes smarter*. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.196.8265&rep=rep1&type=pdf

Lowbrow, Y. (2017). Kitchen & Laundry Miracles! Vintage Appliances and the Women that Loved Them. Retrieved June 28, 2018, from https://flashbak.com/kitchen-laundry-miracles-vintage-appliances-and-the-women-that-loved-them-372152/

Lowe's. (n.d.). Shop Smart Home & Security at Lowes.com. Retrieved June 28, 2018, from https://www.lowes.com/l/smart-home.html

Méndez, M. (2013). Autoethnography as a research method: Advantages, limitations and criticisms. Retrieved from http://www.scielo.org.co/pdf/calj/v15n2/v15n2a10.pdf

Millen, D. R. (2000). Rapid ethnography. *Proceedings of the Conference on Designing Interactive Systems Processes, Practices, Methods, and Techniques - DIS '00*, 280–286. https://doi.org/10.1145/347642.347763

Odom, W., Wakkary, R., Lim, Y., Desjardins, A., Hengeveld, B., & Banks, R. (2016). From Research Prototype to Research Product. *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems - CHI '16*, 2549–2561. https://doi.org/10.1145/2858036.2858447

Sparke, P. (1987). Electrical Appliances: Twentieth-Century Design. Retrieved from https://www.bokborsen.se/view/Sparke-Penny/Electrical-Appliances-Twentieth-Century-Design/5239422

Youtube. (n.d.). Samsung Smart Laundry Features WF457/DV457 - YouTube. Retrieved June 28, 2018, from https://www.youtube.com/watch?v=8fWBSt_WKB4

Zmroczek, C. (1992). Dirty linen: Women, class, and washing machines, 1920s–1960s. *Women's Studies International Forum*, *15*(2), 173–185. https://doi.org/10.1016/0277-5395(92)90098-G