

Smart Cup

The influencing power of smart devices.

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Abstract

As a response to the developments which can be observed on the HCI field, smart homes promote bringing more convenience to users by automating and simplifying tasks. This pictorial describes the development of a research product which aims at exploring how this development on the area of smart devices could evolve and the influence it might have on future everyday interactions. By creating a 'smart cup' with randomized behavior, the influence of so called smart devices on users' behaviors is researched. The pictorial closes by noting that in addition to the aspects identified in the core paper used as guidance for this research, users' expectations significantly shape their interaction, suggesting future explorations of this topic.

Authors Keywords

Smart homes; narratives of smart homes; researching future everyday; smart devices;

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Introduction

With the ongoing development of technology, the focus of attention on the field of HCI has broadened from merely the workspace to our everyday lives [1]. Thus, technology is ever more present in our daily activities, changing the relation people have to it. The growing number of technological de-

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vices present in everyday life furthermore brings new modes of interactions and possibly increases complexity. As a response, smart homes promote making activities easier and life more convenient by connecting and synchronizing devices. Moreover, they are often being advertised with the additional benefits of saving time and reducing energy consumption. However, it has been argued that these narratives are not only false, but that they actually have the opposite effects [9].

In this pictorial, we describe our approach towards this topic and the related human behaviors. It was our intention to explore the role technology can have as a mediator between humans and the world that surrounds them [11]. As it was our goal to explore possible interactions, we decided to develop a physical object. The aim of such an object, which Wakkary et al. describe as counterfactual artifact, is to allow for possible experiences to evolve in the present everyday [13].

Thus, it was tried to develop speculations about possible futures, by making them experienceable.

In the following we first describe the paper that served as a basis for this research, and subsequently the development of the research product.

Focus Topic

The authors of the article 'Convenience and energy consumption in the smart home of the future: Industry visions from Australia and beyond' analyze the context and selling strategies for smart homes. They identify 'time saving' / 'convenience' and 'lowering of energy consumption' as being two of the most commonly named positive side effects of smart homes. The authors note that smart devices on the one hand often target needs that were not existent before but which were created as means of marketing strategy for smart homes and that these smart devices, on the other hand, promote the development of behaviors they originally tried to disrupt, e.g. laziness through one-button control options. The authors come

to the conclusion that the narratives used for marketing smart homes are not only incorrect, but in reality actually evolve into the contrary. As these narratives are capable of shaping peoples' behavior, they suggest that uncovering the falsehood of these narratives is necessary to actually achieve energy-efficiency and simplicity [9].

Research Question

In order to explore how future interaction with smart devices could look like if this development continues and the effect this might have on everyday interaction, a research product was designed. The aim was to probe how people would adapt to a so called 'smart device' which in reality shows no smart but a random behavior instead. Thus, it was the aim to conduct a critical inquiry of a possible future which followed the development described in the paper. This way, the question of what would happen if products in the home weren't honest at all any more should be investigated.

Method

The creation and integration of new objects and technologies in our everyday lives doesn't only allow for new interactions to happen, but also makes it possible to explore how future human-technology relations could look like [12]. It has been argued that in order to truly explore the possible experiences and relations, we need to go beyond developing 'research prototypes', which often only represent a possible future, towards 'research products', which create that future in the present [5]. Thus, the increasingly complex and changing nature of human-technology relations can be explored.

In order to get a grasp of how the future could be created in the presented, we started by looking at examples of smart devices (described on the following page) and, using the method introduced in the 'Future Probing Workshop' [14], deduced future trends from them. Based on these insights, a research object was developed.



qivivo smart thermostat

This thermostat doesn't only smartly control the temperature in users' homes, but also takes their personal perceived comfort into account for temperature setting. By self-learning about the users' feelings, it can adapt to them and anticipate them. Thus, it can achieve a reduction of energy bill of up to 40 %. The device, which discretely blends into the household environment, provides an intuitive interface for easy use [6][7].

COVI

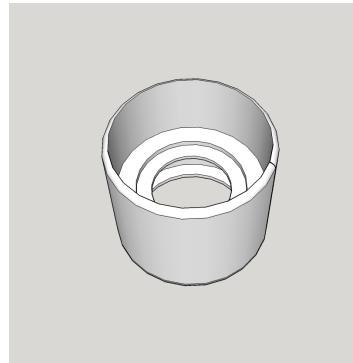
COVI is a light with 'clean shape aesthetics' which can give notifications in a non obtrusive way through light, connect to other smart devices, promoting automation, and react to speech input, giving the possibility for controlling other devices without the need of a button or screen. It aims at promoting a healthy living rhythm, by learning from and adapting to the users' routines [2][8].

edrop

This device can be placed on the faucet to monitor water usage. It sends the information wirelessly to the smart phone of the users, who can keep track of their usage behavior and receive personalized tips about it. Thus, an improvement of water consumption should be achieved. It furthermore offers the opportunity to compare the own usage with the one of other users worldwide [3].

Flic button

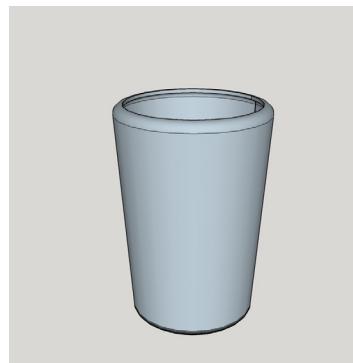
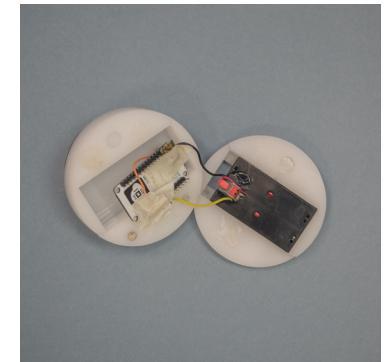
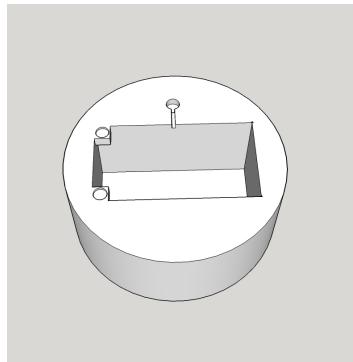
The flic is a button which can save up to three different actions, which can be executed remotely by clicking the button. It promotes an easy and fast single-click possibility to execute actions without the need to take out the smart phone. It can connect to numerous types of devices via blue tooth and works within a range of 50 meter of the device [4].



Research Prototype

In order to explore how a possible future that followed the development described by Strengers and Nicholls could look like, we created a research artifact which used the dishonesty of smart home narratives and materialized in such a way, that it became experienceable in the present everyday. Following the development of smart homes, we decided not to create a new action, but rather to supplement or add to an existing behavior. Given the short time frame of this research, we decided to develop a 'smart cup', which supports an everyday activity everyone performs on a daily basis (drinking) and which furthermore allowed us to develop a functioning prototype within a very short time. Thus, we developed a cup, consisting of a base, containing the electronics, on which a cup was placed (in one case it was placed inside a transparent tube, in the other one it fit directly in the casing, see next page).

Following Odom et al. suggestions regarding research products, it was paid attention that the prototype could function *independently* by using batteries as a power source [5]. Additionally, it was important that the technological elements were designed in such a way, that it looked *finished* and didn't disturb the outer appearance of the cup [5]. That is why, the research artifact

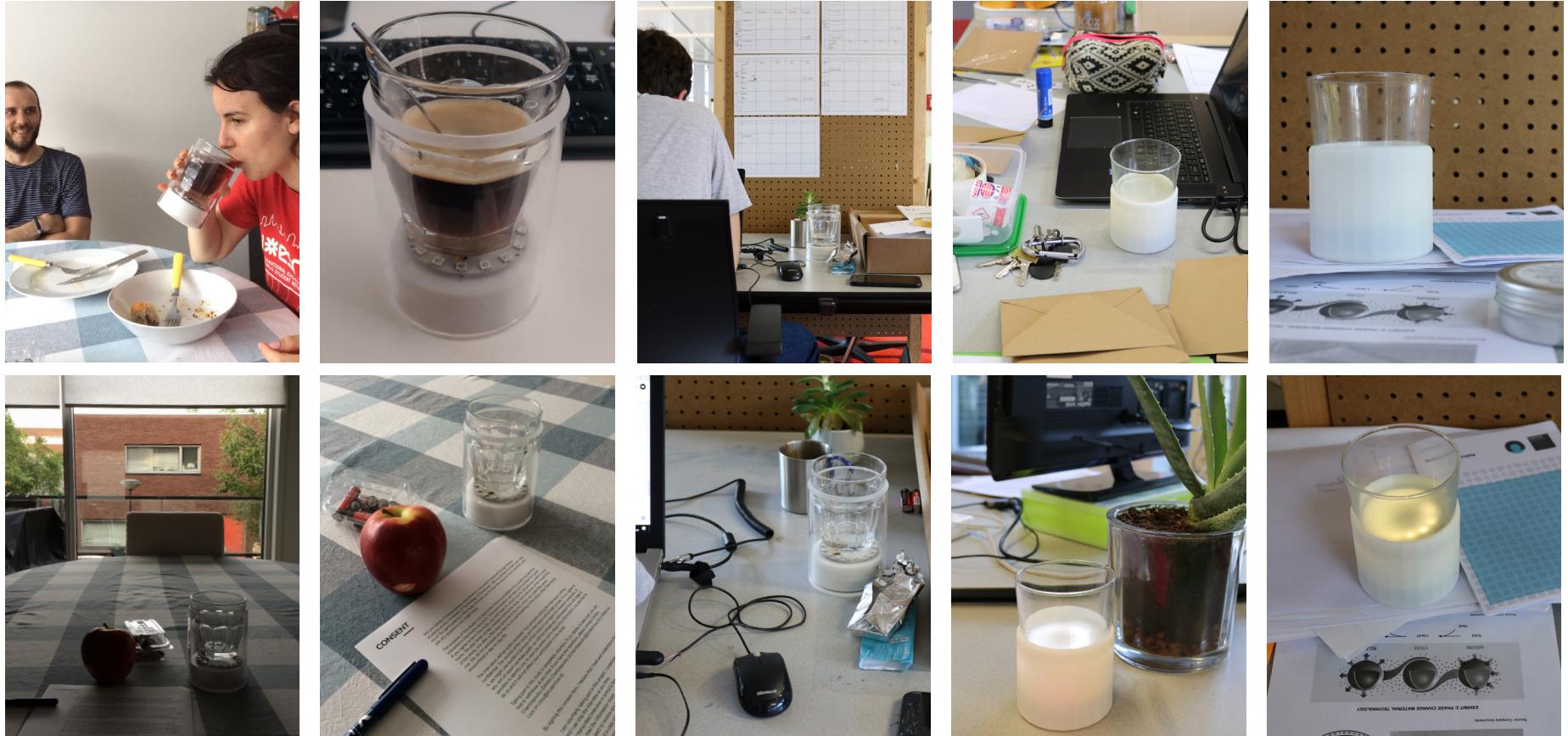


used the common form language of the everyday objects we are used to. This furthermore ensured the sensory understanding of the object [12]. It follows the trend of smart devices blending seamlessly into our environment (as for example the qivivo thermostat, which is shown hanging on the wall between everyday objects).

As examples of smart devices show (qivivo and edrop e.g.), providing an overview which gives feedback about personal performance and promotes an improvement is a popular additional function. Thus, the explanation of the smart cup was based on the potential of the visual feedback provided by the LED ring to improve users' behavior. To keep the research artifact inquiry-driven [5], it was decided not to give participants an elaborate explanation about the purpose of the feedback, but rather to allow them to explore the interaction and their reactions to it. We also decided to follow this line of argumentation, in order not to provide a false narrative, but rather to explore the assumptions users draw for themselves when being confronted with a so called smart device.







Deployment

The smart cup was given to five participants. The first two participants had no design background and got each a cup for a total of ten days. The second round of deployments was conducted within the environment of the University of Technology Eindhoven. The participants were all design students, who had no knowledge about this research or the related course. They used the cup in their working environment of University for four days in total. At the beginning of each session, the cup was introduced by recalling examples of smart devices

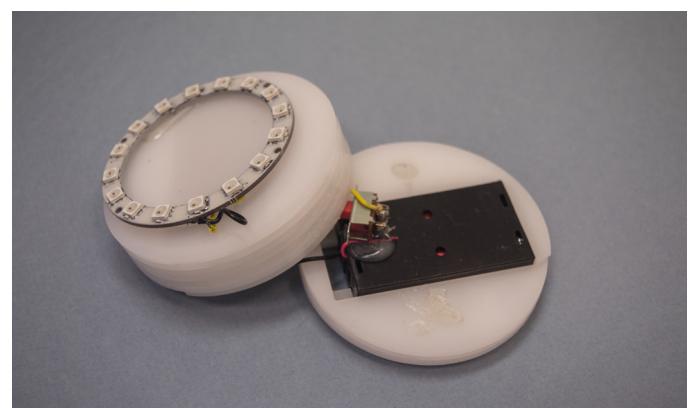
and placing it in that context. Throughout the deployment, participants could ask questions or give feedback via text messages or directly talking to the researchers. In the end, a final interview was conducted, in which it was asked how the cup was perceived in general, if it achieved a change in behavior and, after explaining the research background, which personal conclusions the participants drew from it.



Evaluation

Although participants weren't told what the purpose of the cup was, they tried to figure out how the device worked and what the feedback meant, because their expectations towards smart devices include that these provide added value in some way.

The need to figure out what the visual feedback meant is shown in the quote of participant 1: "No, I don't know what is doing. It is very abstract and I have to think about

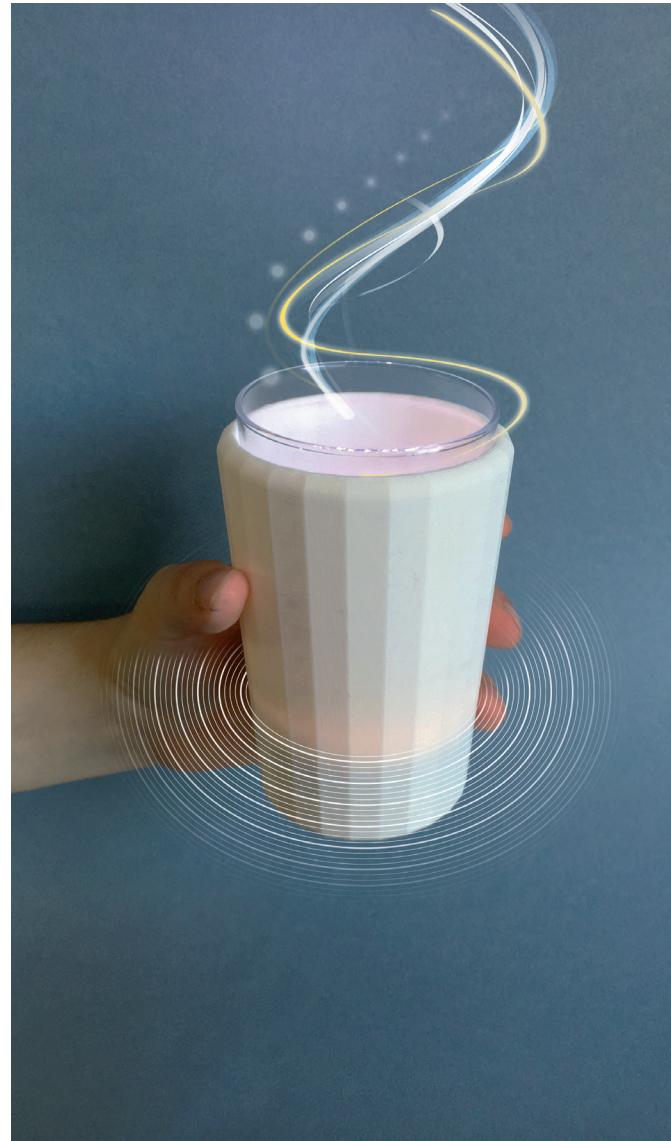


it. (...) I need to know the purpose!". One of the participant with design background on the other hand said that he tried to use his knowledge about the electronic components to identify it's purpose ("At some point I tried to see like, what is in here, are there sensors, I tried to figure out how it worked. So I could try to justify how it worked. And I couldn't", participant 3).

While the design students quite quickly associated the lights with the encouragement to drink more water, either

because they were familiar with this kind of tests ("It's funny because a couple of weeks ago I had another user test with also a bottle", participant 4), or because they made the logical assumption (participant 3 for example said: "At some point I just thought: Ok, there is a glass of water on top of the lights, there is a light under it, you use a glass of water to drink water, this could be an indication to drink more water"), the other participants had no direct association with the feedback, but rather open-ended ideas about it (indication about temperature of coffee or cumber of coffee cups drank, participant 1).

The way in which the smart cup influenced their behavior differed. In one case, it changed the behavior of an participant, resulting in him drinking more water ("I started drinking water whenever the lights went on", or: "It lit up quite a few times today, it was funny! And of course I drank, like a pet!", participant 3). It also showed to increase users' awareness, either about drinking ("But sometimes I



did know it was quite some while ago that I had water, so I was like: Ok, I will take a sip soon", participant 4) or energy consumption of such devices ("I was turning it off every evening when I was leaving the office and turning it on again in the morning. (...) Because it consumes too much battery", participant 1). Lastly, even if no direct effect was noticed, an increased attention towards the device was mentioned ("(It was) more drawing my attention to it, than communicating", participant 5).

The authors of the paper described in the beginning stated that smart homes and smart devices, together with the narratives and people using these narratives to sell these devices, shape our behaviors, making it thus important to make these narrative clear. This is how in their opinion a truly energy and time saving consumption can be achieved, not only promoted. Our research has shown that not only the narratives behind smart devices, and the actual behavior of the devices have an influence on users' behaviors, but that also the specific expectations people have towards smart devices affect their actions. Smart devices can trigger general expectations, like the one of a somehow magic experience ("I explained her (somebody in her office) what it was but she doesn't really understand a lot about technical stuff so when I told her it's a smart cup she was like 'wow'", participant 1; "and, of course, they [smart devices] are cool!", participant 3) or more specific ones, like the ones of providing information for improvement ("I think especially as a designer, you think immediately about the purpose of a thing. And then, because it is about water, and also because I did the other user test, I think it is about getting a signal when you should drink something", participant 4). As shown in the beginning of this paper, this phenomenon is also used in current smart devices, which promote to help improve consumption behavior, by providing information about the

own consumption (as qivivo or edrop for example). Lastly, the expectations towards smart devices also include making things easier ("they can facilitate our life, they can automate repetitive tasks", participant 1; "devices that check on certain behavior and anticipate needs in our daily live as well as make our daily lives easier", participant 2).

We believe that when talking about the future development of smart homes, and smart devices in general, it is not only important to take the narratives behind them into consideration, but also to look at, and address the expectations users have in them. As the associations people have with the term 'smart' are shown to be subjective (from a magic experience, over a helpful one to an increase of convenience) and happen on an unconscious level (using and adapting to the device albeit being sceptical about its behavior) they have a strong influence on their expectations and hence also on the interaction and the thus resulting relationship between people and technological devices.

Discussion

We have described our approach to researching a specific topic about the future everyday by developing a research artefact. This research was conducted in the context of the course 'Researching the Future Everyday' and the short time frame had an influence on the study. However, we believe that this research provided some valuable insights for future work.

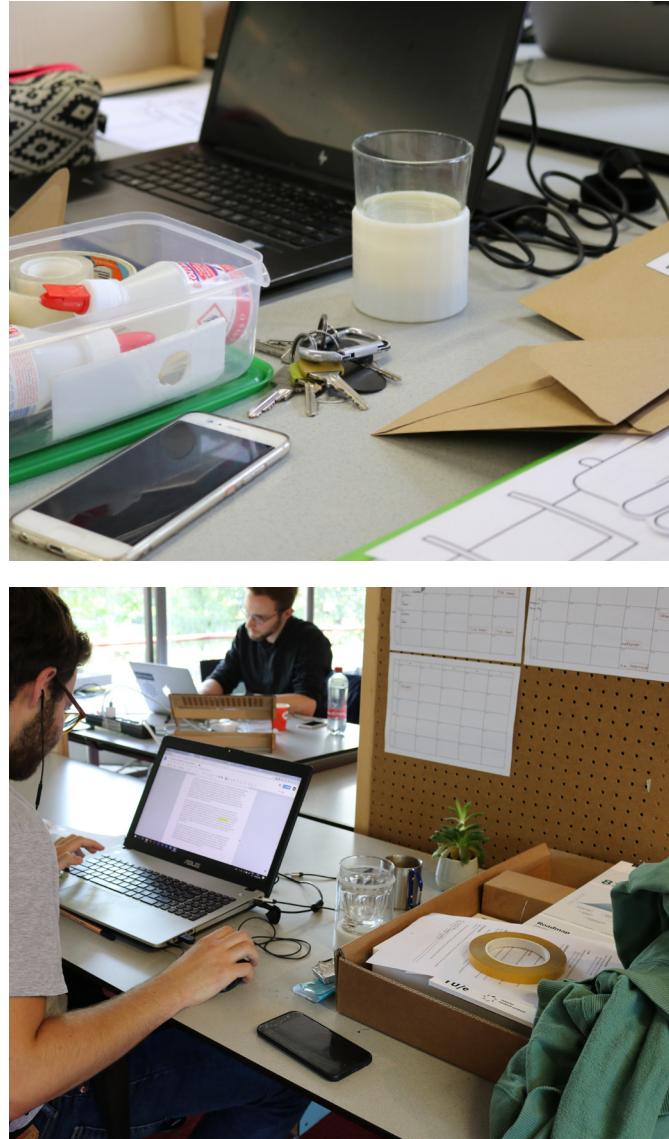
Due to the restrictions in time and materials, it was decided to prototype a cup which gives feedback using light, instead of exploring other methods of feedback which would have been more time consuming to develop. The cup was selected, as it is an object which is very much present in



Picture taken by Lenneke Kuijjer



our daily environment. This resulted in our research prototype blending in the context of use. The lights as means of feedback were mainly in the periphery of users' attention. The positive aspect of this is that it was described as being not obtrusive or disturbing. But, at the same time, users reported often not seeing the feedback. This was also influenced by the context in which the cup was used, which often already included a lot of other electronic devices and objects, many demanding for users' attention ("But I didn't see it blink it again. Also in the office there are a lot of distractions and a lot of notifications around. First I have my phone where there are so many WhatsApp groups, then there is maybe sometimes facebook messages. Then I have the screen with open tabs like my personal e-mail where there are quite some notifications there then I have my work e-mail where it's super busy, the I have open my work, then... Oh! Yes, I have this annoying slack groups which is a complete chaos with the notifications and then of course I have



the personal real life notifications from people in the office that talk to me. So yeah it's very hard to follow such an over-notified environment and then on top of that see if the cup is lighting up", participant 1). For future studies it might be interesting to explore other means of feedback. The everyday-ness of the product also seemed to encourage an everyday way of providing feedback. One participant for example sent messages via WhatsApp during the deployment, while another one used post-it notes to write down observations. When doing further research on the future everyday, it might be interesting to think about the research and evaluation method, as this might allow for additional insights to evolve.

As the feedback of the cup given was randomized, it sometimes happened that participants saw the lights turning on after they had just drunk. This moments caused either doubts about the behavior, suspicions about the feedback being random or the code having an error. For future studies, it might be valuable to either eliminate this by refining the code or to specifically use this confrontations to trigger certain reactions which can be studied.

It has been seen that aspects like the magical effect and information for behavior improvement are expected to be embedded ever more in our daily environment, instead of being an addition to it. This means that when exploring the future everyday we should look at how the interaction with already existing devices could develop and change, possibly when technology comes in, instead of exploring possibilities of only adding technology to our daily life.

We believe that the different results shown by users with a design background and by those without are an interesting topic for further exploration. For future studies we thus suggest to select a bigger number of participants and

analyze the results in relation to their background more in detail.

Lastly, it must be said that conducting a user test in which certain information is retained also brings ethical concerns with it. Throughout the project we have focused on how researchers can deal with this topic, which resulted in giving the users very limited information, instead of providing false information, about the type of feedback given for example. The result was that participants were sceptical in the beginning, but it nevertheless provided insights on their reactions and behavior. We think that when researching a topic where ethical issues are one of the main aspects, it is inevitable to be confronted with this type of concerns. It is thus important for researchers to be clear about the insights that should be gained and the way in which this can be achieved, without being untruthful to the participants.

Acknowledgements

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