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Cup Builder - Applicability of Gamification when Designing for Behavior Change towards Sustainability in Public Places

Master's thesis in Interaction Design and Technologies

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Cup Builder prototype and logo

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Abstract

Gamification is a widely studied concept and is applied to various contexts such as marketing, healthcare and education. Sustainability is another issue that more and more people claim to be concerned about at home, when buying food and clothes or when travelling. But this principle does not always come into practice, especially out of home, either because individuals are not aware of what impact they can have among the crowd or because it is difficult to change habits. Gamification in the context of sustainability has already been investigated claiming to succeed in increasing people's awareness about sustainability and in turn decreasing their energy consumption. The studies have however mainly been conducted in familiar environments, such as home or workplaces where people know each other. In the context of public places, such a relation to strangers does not exist and the individual's sense of responsibility is commonly rather low. These aspects bring along the need to find out what the addition of game elements really affects and how it should be applied to achieve a general change of behavior with this new challenge. This thesis aims to investigate gamification related to behavior change within the frame of the research project TRIBE. Bringing together several European partners, among whom the Interactive Institute Swedish ICT, the focus of this 3 year research program is set on gamification in public buildings to lower energy consumption.

The specific context to be explored within this thesis is cafés on the campus and the consequent focus on the consumption of paper cups and reusable cups. A concept of a game has been developed resulting in the implementation of a high-fidelity prototype which has then been tested in a user field study. It was aimed to find out how the application of game elements can encourage people to use more reusable cups. Therefore the design solution consists of two versions, one being a visualization of the general consumption of cups at the café, the second one adding several game elements to it. Additionally, as a result of thorough investigation of former work combined with the findings of this thesis, a set of guidelines has been formulated which intends to support designers and researchers investigating in a similar area.

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1 Introduction

Creating environmental sustainability represents a global goal that is part of the Millennium Development Goals defined by the United Nations in 2000 ("Millennium Development Goals", 2015). "Sustainability creates and maintains the conditions under which humans and nature can exist in productive harmony" ("What is sustainability?", n.d., para. 1) but it is the responsibility of people to achieve this by adapting their behavior. This could include consuming less electricity and water, waste separation or taking the bike to work. One remarkable issue is the use of disposable coffee cups. Americans, for instance, throw away 25 billion styrofoam coffee cups every year ("10 Fast Facts on Recycling", 2013). Sweden also is known as a country of coffee lovers and statistics put them on rank four on the list of countries with the highest average per capita consumption (International Coffee Council, 2012). This means Swedes consume 8.1 kg coffee in average every year, 18.1% of it is taken out of home (International Coffee Council, 2012). Certainly a lot of these coffees are filled in disposable coffee cups instead of reusable ones even though there are already incentives that encourage the opposite. Companies such as Espresso House, for instance, introduced reusable mugs, one of those representing the amount of plastic used in 28 disposable cups ("Ett smartare val för miljön", n.d.). While reducing waste with the use of disposable cups might only seem like a small part of the whole, it is indeed an important aspect where a change of people's behavior is needed.

Focusing on other energy related area, researchers have already investigated several ways to make people aware of energy-saving actions and to encourage them to integrate these in their daily life. One recent trend that also appears more and more in this field is the introduction of gamification, serious games or pervasive games. Examples like the application PowerHouse (Gustafsson et al., 2009) show that games have the potential to decrease energy consumption at home or work simply by addressing people's will to achieve a goal through cooperation and competition within a game. Further, incentives like the Fun Theory by Volkswagen (Volkswagen, 2009) are widespread in media and demonstrate the promising effect that games or game elements have on people even in public. Making the rather annoying action of recycling more fun with a simple adaption can encourage people to change their behavior. Engaging people to act sustainable in rather public places is more of a challenge as the personal sense of responsibility usually decreases, especially since no one has to take care of the bill. Public buildings, such as universities, libraries and cafés are therefore worth being investigated within this area.

The Interactive Institute Swedish ICT will conduct a study with European partners in the coming three years in which they develop a social game that encourages people in selected public buildings such as schools and offices to change their behavior to be more energy-conscious (TRIBE, 2014). This thesis is based on a collaboration with the team at Interactive Institute Göteborg. Yet, while they amongst others assume that a game is the appropriate kind of intervention to use in this case, our goal is to see the hype around gamification critical. Other projects, for instance the application WattBot (Petersen et al., 2009) also make obvious the impact of solely feedback systems that visualize people's consumptions and with this motivate them to decrease it. Since both approaches, interventions with or without game-elements, show positive effects on people's behavior, the question arises which one is more effective.

1.1 Research Question

The main research question that we strive to answer during this thesis is as follows:
In the context of a public place, how can gamification be designed in order to influence people's behavior towards sustainability?

Based on user evaluations of several prototypes of a visualization and a gamified version of this intervention, a field study in the context of a café on a campus was conducted in order to answer a driving question: **Can the addition of game elements to a visualization make students use less disposable cups at campus cafés?** The comparison of what effect the interventions have serves as base for a set of recommendations on the use of gamification in this area to support other designers.

1.2 Delimitations

As the target group consists of students on the campus of Chalmers University of Technology, we expect already existing knowledge and awareness of sustainability issues which the study can be built on. This also implies that conducting the study in another context would have possibly resulted in different findings.

Due to a certain time limit our study has to focus on short-term effects that the game and visualization prototype have on the participants. The long-term effect can only be predicted so we are not be able to answer the question of whether people would actually change their everyday behavior beyond the study or fall back on their 'old' behavior. In addition, the behavior to be addressed with this thesis is very specific, which is why the results of the user study are valid only for the chosen context. But the guidelines are created to be applicable for other situations and behaviors in the field of sustainability in public places.

In order to have a real influence on the general energy consumption by changing to the use of reusable cup, one would have to consider the material and the manufacturing of the different cups as well. Those would have to be used for a certain amount of time to even out production resources and to actually become more environment-friendly than disposable paper cups. Even though we are aware of these facts, they will not be considered in this study since this is another large field for research and lies not in our scope. Lastly, there are different reasons for people preferring paper cups over reusable cups, such as logistical aspects determining where the different cups are positioned, but they will not be considered further.

1.3 Stakeholders

One obvious group of stakeholders are the visitors of the cafés, students in particular were defined as the target group. Motivating them to adopt a sustainable lifestyle on the campus does not only create a better environment for them to perform their activities but can also lead to a transfer of this behavior to their home and other situations.

Café Linsen as the café the user field study was conducted in, is the stakeholders on the other side of the counter. Sustainability is one of their concerns as they claim using "environmentally friendly packaging" ("Linsen", n.d.). In the best case, our developed concept could be introduced in their café in the future, to even increase sustainability and the awareness of it.

Chalmers University of Technology as the institution the cafés are integrated in, would also profit from an adapted behavior among their students. Whilst this thesis only addresses one specific issue, the students' raised awareness of how easy it is to make a change could lead to a generally increased sense of responsibility. Furthermore, our research as basis could help create new interventions to inform and engage students and with it decrease energy consumption on the campus. The university has a double interest, since this thesis is part of the requirements to obtain the master's degree.

Interactive Institute Swedish ICT represents another stakeholder, as one of the research institutes working on TRIBE, the project we are associated with. This thesis can be seen as contribution to their work and at the same time valuable input and inspiration can be received from them in return.

Lastly, we, as students of Chalmers conducting this thesis, want to realize a project that allows us to apply our knowledge about human computer interactions in a practical domain and test various methods to develop it further.

2 Background

The use of games and game-elements has been widely studied in various contexts. One trend follows the question how to apply this principle to change people's behavior and attitude towards sustainability and energy related issues. Besides and also focusing on this aspect, several kinds of interventions have been developed that visualize and give feedback about people's energy consumption. This chapter will introduce the research area followed by the research problem this thesis is based on.

2.1 Research Area

The following paragraph will give examples of some research projects in the area of gamification related to sustainability and highlight their essential aspects that are relevant for this thesis.

2.1.1 Interactive Institute Swedish ICT and TRIBE project

Swedish ICT groups several research institutes that investigate in the field of information and communication technologies (ICT) with the aim to "create groundbreaking user experiences" ("We are Interactive Institute", n.d.). The Interactive Institute as part of that group has offices in several swedish cities and focuses on different key areas including Future Energy Use Game design and gamification ("We are Interactive Institute", n.d.). Those are addressed in an ongoing research project TRIBE which is conducted by the Interactive Institute in Eskilstuna and Göteborg, the latter being the partner for this thesis. The TRIBE project is a three years research project within the EU program Horizon 2020 and started in March 2015. The participants of the project set themselves to "contribute to a citizens' behaviour change towards energy efficiency in public buildings" (TRIBE, 2014, p. 5). Their aim is to develop a social game that engages people by using real time data about their energy consumption. The studies will be conducted in 5 pilot buildings including schools and offices. Main task of the Interactive Institute Göteborg will be the development of the serious game and the processing of the data from the monitoring systems. The game itself will be based on avatars that the player has to control and make perform energy-saving actions (TRIBE, 2014).

2.1.2 Private places

Within the same area but focusing on more private environments, other projects have already been realized. Gustafsson et al. (2009), for instance, designed a pervasive game that aims to encourage a reduction of the energy consumption in households, with teenagers and their families as the target group. The concept of their multiplayer mobile game Power Agent is based on learning what actions help to save energy at home and then applying this knowledge in a group competition. The theme makes every player into an agent receiving missions to save energy. In order to receive real time data and to be able to give direct feedback about changes in domestic energy usage, the game is connected to an electric power meter. Pervasive games like this, as Bång et al. (2009) claim, are able to "transform... the home into a persuasive environment in which the user can learn" (Bång et al. 2009, p. 1) about energy related issues. With a different approach, Bång et al. (2006) investigated the use of a persuasive game by taking Fogg's theory (2002) about persuasive technology as inspiration. Their game called PowerHouse is set in a simulated environment of a home, where different characters and their actions can be observed and controlled (similar to the Sims). Energy efficient behavior of the avatars results in rewards in form of virtual money to be used within the game. Another example, EcoIsland by Takayama et al. (2009), deals with reduction of

Co2 emissions at home. Their concept builds on a stationary display at home that shows a virtual island with avatars of each family member. With the help of sensors and self-reports, data about their actual consumptions is collected. If they reach a certain level the water level rises and finally floods the island.

2.1.3 Use of avatars

It is apparent from the above mentioned examples, that the use of avatars and characters in a simulated environment seems a common way to engage people to adapt their behavior. It allows to visualize actions in the virtual world that do not have real consequences outside the game but could be directly transferred to the real world. Bång et al. (2006) expected people to "try out different behaviours and configurations several times and reinforce the learning" (p. 128). In addition, people can identify with these characters and develop an emotional connection to them over time. Whilst research mainly investigated this aspect in private places, the TRIBE project (2014) aims to introduce the game based on avatars also in public buildings.

2.1.4 Collaboration and Competition

There is another aspect appearing in various projects which is of social nature. Collaborations on the one hand and competition on the other, essential game elements, are used to keep up the engagement level. The results of the study by Gustafsson et al. (2009) showed that the energy consumption decreased due to two main motivational factors. Firstly, competing with the other team as well as within the team gave the participants the ambition to win. Leaderboards as used, for instance, in Nguyen (2014) are a means of stimulate competition since they let users easily compare their performance to others. Secondly, the collaboration within the team gave the participants peer pressure to perform well in order to be able to contribute to and support the own team. These social interactions are considered crucial "for curbing energy consumption, fostering community collaboration and increasing people's intrinsic motivation" (De Luca and Castri, 2014, p. 27). Their Social Power game concept enables these with so-called Energy Hives, compositions of energy related points of interest that people create together in a community. Besides, Takayama et al. (2009) encourage direct social interactions beyond the boundaries of one's home by introducing a trading system where emission rights can be sold to other teams.

2.1.5 Existing Guidelines

To the findings from the above mentioned projects, some guidelines can be added that have already been developed for games and game-like applications with focus on sustainability. Simon et al. (2012) involved users in an iterative design process for a pervasive game. The resulting requirements included unobtrusiveness, cooperation and privacy as essential aspects. Firstly, a game should not prevent the participants from doing their work, it should rather merge in the daily life. Besides, cooperation instead of individual playing just like teamwork was required of such a pervasive game at the workplace. Lastly, the game should respect one's privacy by letting the user decide what personal data he wants to share with others. In addition, Huber and Hilty (2015) very recently formulated the following guidelines for the use of gamification in sustainability: Respecting Consumers as Individuals, Respecting the Consumers' Autonomy, Introducing the Social Level, Enabling Collective Action. Users should be seens "as social actors who are engaged in the process of sustainable consumption" (Huber and Hilty, 2015, p. 381) keeping in mind that they are individuals with different backgrounds and different goals. Because of this, one should allow the user to define his own goals and the route and speed he is taking to achieve them. Comparing and sharing are suggested as means of social interaction with the possibility to put the actions in a relevant

context. Lastly, encouraging a group instead of individual experience through collaboration and competition leads to greater effects.

2.1.6 Means of Interactions

Research in the area also shows the different means of interaction that are used to introduce game elements. PowerAgent (Gustafsson et al., 2009), for instance, is implemented for mobile phones, which brings the advantage that users can have it at hand all the time. It can therefore be used in daily life. This project also included the use of the phone camera with which the players could document their energy saving actions. Furthermore, the mobile phone enables players to chat with each other in the game. The chatting function is especially interesting when designing for young people, since they are already very much used to this kind of communication (Schoech et al., 2013). In EcoIsland (Takayama et al., 2009), phones are used as support for the main stationary display where the game is shown. With this, participants are able to constantly have access to an overview of actions they can take to prevent high energy consumption. Feedback in WattBot (Petersen et al., 2009) is also delivered on the phone, even though Nakajima and Lehdonvirta (2013) discourage the use of mobile phones for ambient expressions, since it is rather a device people use to express themselves. The game design that emerged during a study by Simon et al. (2012) included notifications that would be delivered via the mobile phones, so the game would not be limited to the workplace. On the desktop computer, on the other hand, notifications are easy to be integrated with normal work, meeting the requirement of being unobtrusive. The desktop computer was also used as means of interaction with the game Energy Chicken by Orland et al. (2014). It is based on real time data of each employer's devices' energy consumption which is mapped to the health of virtual chickens. With this serious game they claimed to "make energy use contextually relevant to daily life" (Orland et al., 2014, p. 44) and to change employers' behaviors without having to make expensive changes on the building. These examples make use of devices that people usually already own, yet they are focused on individual use. Besides, they are somehow separated from the actual source of consumption which would be lights, plugs or radiators. Projects developed within the Fun Theory (Volkswagen, 2009) show that the game can be directly added to the object that causes the behavior to be changed. In the Bottle Bank Arcade Machine the whole glass container was converted into a game, using its standard functionality and already possible interactions while adding a screen, lights and sounds. The World's Deepest Bin also needed no extra device to play, the bin itself became the object of interest.

2.1.7 Feedback and Visualization of Data

What most of the research projects in the area have in common, is the use of feedback in different forms. Whilst gamified interventions include game elements to enhance people's engagement, several other research projects solely rely on immediate feedback to encourage people to act more energy-conscious. Real time energy feedback is often provided using smart meters or sensors that measure electricity, water or heating usage in a building (Takayama et al., 2009; Gustafsson et al., 2009). When seeing what they actually consume and what effect different actions can have, people become motivated to lower these numbers. By visualizing consumption in different ways, this "feedback provides an awareness that is otherwise unavailable" (Brewer et al., 2013, p.191). Since electricity, for instance, is a rather abstract occurrence, some research focuses on making it more tangible. The Power-Aware cord (Gustafsson and Gyllenswärd, 2005) displays energy consumption with glowing light that changes its pulse, flow and intensity according to the amount of electricity used by it. This visualization helps people to understand changes, the Watts become somehow visible and easier to grasp. Besides, it gives feedback directly where the changes happen. Watt-Lite (Jönsson et al., 2010) is another tangible installation that lets people interact with and thereby

explore the different levels of electricity consumption of a building. In this case, three torches hanging from a ceiling represent the lowest, highest and current real-time consumption and can be compared directly to each other. In the application WattBot (Petersen et al., 2009) people get real-time feedback of the consumption of different devices in their home directly onto their phone, which makes the data accessible any time. The consumption is visualized in bars that are color coded (green for low consumption, red for high consumption) and animated for each devices that is currently using energy. The animations make directly visible what is consuming how much, which would encourage people to turn off devices that are currently not needed.

2.1.8 Use of Metaphors

Furthermore, the use of metaphors as a means to provide immediate feedback is popular in several gamified applications. Chickens become healthier and lay more eggs (Orland et al., 2014), the water level on a virtual islands changes (Takayama et al., 2009), a tree is growing leaves and blossoms and an iceberg is getting bigger (Froehlich et al., 2009). In a study by Midden and Ham (2009) it was also observed that social feedback has a positive effect on people to act more energy saving. This feedback, both positive and negative, was given by a robotic agent, the iCat, that would tell people about their consumed electricity supported by facial expressions both directly depending on people's interaction with a simulated washing machine. Lastly, some gamified interventions introduce feedback in form of points and other rewards that are received directly after performing a correct action in the game, as implemented, for instance, in Power House (Bång et al., 2006). These kind of feedback lets players directly compare their performance with each other which makes it more meaningful and motivating for them.

2.1.9 Interventions related to consumption of cups

Looking at the issue of waste produced by paper coffee cups, several projects have been realized that deal with how to change from reusable to disposable cups in coffee places. The CoffeeCup project ("Green Town Stockholm CoffeeCup Project", 2014), for instance, aimed to introduce the Green Town Stockholm coffee cup that was made out of metal and reusable. The incentive for the customers was represented by a 5 Swedish Crowns price reduction on the purchased coffee in all participating coffee shops. The company KeepCup set themselves to produce reusable cups that customers can design themselves but that would still fit with the standard machines at coffee places (KeepCup, 2015). Another initiative focuses on universities in the US. The Kill the Cup University Challenge (Social Ventures for Sustainability, 2014) encouraged colleges to compete in reducing waste caused by paper coffee cups. Students would bring their own cup, take a photo of it and upload it which would reward them with points and make them participate in a prize raffle. Introducing fun and social media marketing in that case, represented a positive effect on students' motivation (Social Ventures for Sustainability, 2014).

2.2 Research Problem

There are two main directions in research dealing with how to change people's behavior towards energy consumption. Providing them with immediate real-time feedback on the one hand, and using game elements or even full-fledged games on the other hand, the latter usually also building on direct feedback. Ensuing from this it seems worth studying whether the introduction of game elements adds much more to just providing appropriate feedback. The use of games in this area has emerged due to the "belief that actively engaging energy users in energy saving is more effective in changing behavior than simply providing

information about energy conservation" (Orland et al., 2014, p. 44). Moreover, feedback "represents so far the most successful measure in changing user behaviour and achieving energy savings" (TRIBE, 2014, p. 15). Yet, the direct comparison of visualizing consumption and with it giving direct feedback with and without gamification has, in our view, not been done so far. Besides, some general problematics with gamification have already been studied, that make it important to investigate this phenomenon critically. Orland et al. (2014), for instance, found out that when removing an incentive, people would rather stop saving energy again. And whether introducing game elements can have positive long-term effects on people's motivation to change behavior is still not answered. These facts raise the question whether or not introducing game elements has a greater impact on people's behavior than using a visualization for the consumption.

Moreover, research on gamified interventions so far has primarily been done in rather private environments, at home or in the office space. This implies that people are very familiar with and have strong connections to the environment and the people. Besides, they have certain routines as they spend much time at these locations. Yet, indeed the context in which games, gamification and feedback systems are introduced is important to consider, especially when people are required to interact with each other or results are made public. This is why extending the research area to different environments seems very interesting. A place where social connections are not that strong and people come and go irregularly represents a challenge for introducing a game where collaboration and competition might be required. Furthermore, people's sense of responsibility is usually higher at home or work than in public place. Based on this, the research question can be extended, seeking to investigate the use of gamification in public places, in our case cafés on a University campus.

Lastly, most projects focus specifically on energy consumption related issues. Collected data mostly focuses on electricity, water and heating, yet, other actions such as waste separating, respecting fellow people or using reusable instead of disposable coffee cups are examples that are equally important to create a sustainable environment. Even though these kinds of actions are not measured as easily they provide an interesting challenge. There is indeed a problem with the amount of waste produced by disposable coffee cups and there are also several initiatives that deal with reducing this. Yet, they rather focus on the introduction of and the product itself, instead of addressing people's behavior change. Mostly, they assume that it takes little to motivate people to change the kind of cup, price reduction being one imagined effective incentive. Introducing new interventions like gamification in this specific context and focusing on the related behaviors, makes it possible to thoroughly investigate the effects and then possibly transfer it to others contexts.

The above mentioned trends in recent research form a good basis for inspiration all along and lead to the focus of our study.

3 Theory

Investigating a new trend such as gamification requires studying not only its definition, but also its goals, possible problems and where it emerged from. Since one of the goals is to change people's behavior, one has to immerse into areas in psychology that deal with this human aspect, including motivation and behavior change models that can be applied to this thesis. Besides explaining these terms, this paragraph also deals with the issue of public place as one underlying aspect of this thesis' research question.

3.1 Games

Besides gamification, two other interesting concepts exist, namely pervasive games and serious games that apply game elements in new contexts to engage users. The following section will therefore introduce all three in order to class the concept approached in this thesis.

3.1.1 Gamification

As there are more and more companies introducing gamification in their services and products, as well as multiple researchers investigating this topic, there is a need to have a widely applicable definition. Yet, to even go back a step, defining what makes a game a game is where to start. According to Kapp (2012), "a game is a system in which players engage in an abstract challenge, defined by rules, interactivity, and feedback, that results in a quantifiable outcome often eliciting an emotional reaction" (Kapp, 2012, p. 7). Similarly McGonigal (2011) defines the four elements games have in common are a goal, rules, some form of feedback system and the fact that players participate voluntarily. Only in combination these elements create the full experience of a game (Kapp, 2012). Furthermore, (video) games are claimed to be made for entertaining and engaging people (Deterding et al., 2011a). It is all about having fun while playing which is usually what happens when succeeding in solving a task (Koster, 2013), such as finding a quest or simply breaking the highscore. Hunicke et al. (2004) define 8 kinds of fun which can be used to describe and analyze why different games are appealing to different people:

Sensation: Game as sense-pleasure.
Fantasy: Game as make-believe.
Narrative: Game as drama.
Challenge: Game as obstacle course.
Fellowship: Game as social framework.
Discovery: Game as uncharted territory.
Expression: Game as self-discovery.
Submission: Game as pastime.

Elaborating game elements further, one can also divide them into formal elements such as the players, objectives, rules, conflict, boundaries and outcome as well as dramatic elements: challenge, play, premise, story and character (Fullerton, 2014). It is those dramatic elements that enrich a game experience, engage the player and make him emotionally connect with the game (Fullerton, 2014). What makes players immerse in games is the feeling of competence and control they provide while becoming more challenging the more one learns. Besides, games give the player autonomy, as the player himself decides to play, and has even more choices about how to play. A sense of relatedness is lastly provided especially in multiplayer

games, which encourage mutual support among the players (Bozarth, 2011). All these elements foster motivation even though playing often leads to failing in the first place. This paradox of failure, as Juul (2013) names it, means that people usually try to avoid failing but on the other hand prefer games that make us fail (Juul, 2013). This phenomenon makes games especially valuable for learning since it allows to learn by doing and failing without creating negative consequences on real life (Dieleman and Huisingh, 2006). Furthermore, a game being a kind of simulated environment enables the user to "safely explore cause- and effect relations and uncover new behaviors" (Bång et al., 2006, p.124).

Taking this as a starting point, gamification makes use of several of the elements that define a game and transfers them to a non-game context (Deterding et al., 2011a), be it in marketing, healthcare, at the workplace or in education. Yet, gamified services or products are not like full-fledged games but rather make use of some specific game elements (Deterding et al., 2011b), which commonly are "points, levels, and achievements" (Nicholson, 2012, p.1). Apart from rewards, further gamification elements are objective and specific rules, immediate feedback and competition (Buckley and Doyle, 2014). The general goal of gamification is "to improve user experience" (Deterding et al., 2011a, p. 2425) and "to engage people, motivate action, promote learning, and solve problems" (Kapp, 2012, p.23). Furthermore, used in a proper way, a gamified application has influence on people's behaviors and potential to change them (Blohm and Leimeister, 2013). Games, since they are entertaining, are therefore means to motivate people to perform activities that usually are boring, annoying or troublesome.

Despite the high potential of above mentioned game elements on user's motivation, often only the element of external rewards are applied. Pointedly gamification can therefore be explained as "driving any desired activity by tracking it and adding a feedback layer of points, badges, leaderboards, and incentives ontop" (Deterding, 2014, p.306). Since quite some time critics have begun to demand a rethinking of the phenomenon, one requirement being to include more gameful experiences given through motivational affordances instead of simply adding some obvious game elements (Huotari and Hamari, 2012; Deterding, 2014). Points and badges represent the most boring ones (Nicholson, 2012), and by "taking the thing that is least essential to games and representing it as the core of the experience" (Robertson, 2010, para. 4) gamification will not have the desired profound effect on the user's motivation and engagement. Moreover, critics warn against seeing in gamification - which, should rather be called pointsification (Robertson, 2010) - only the "simplicity, smoothness, and ease with which the wild, magical beast of games can be tamed and integrated into any other context" (Bogost, 2015, para. 8). Instead of adding flashy colors, noises and cartoon like characters that make a system seemingly look like a game (Bozarth, 2011), it has to be made more meaningful to the user. The different kinds of users, player types and contexts have to be considered, for instance by letting users set their own goal. By not neglecting the various needs and requirements, meaningful gamification will lead to better long-term effects (Nicholson, 2012).

The term gamification has most likely been introduced in 2002 by Nick Pelling, a game developer ("The Gamification Inception", 2014), but according to Deterding et al. (2011a) it became widely used not before the end of 2010. Although this implies that gamification is a rather newly emerging trend, the principle has already been around for some time (Prince, 2013), though without being specifically termed like it. In the context of marketing bonus points for customers of supermarkets or department stores and miles collectable by frequent flyers (Prince, 2013) feature some characteristic aspects of games that help to get people

engaged. Even earlier, in 1981 already, Malone (1981) investigated why games are fun and captivating and how this could be applied to make learning more enjoyable. Later on, terms such as “playfulness” (Deterding et al., 2011b, p. 9), “ludic engagement” (Gaver et al., 2004, p. 4) were established, introducing fun and play in user experience as well as “games with a purpose” (Von Ahn and Dabbish, 2008) using games to engage people in different contexts.

3.1.2 Pervasive Games

A pervasive game, in contrast to a gamified application, is an actual game “that connects the real world and the virtual world” (Kittl and Petrovic, 2008, p.1), so that there are no clear boundaries in between. This twists the meaning of a usual game which is usually “separate from the rest of the world” (Fullerton et al., 2004, p. 42), the actions within the game having no consequences outside of it. The addition of the word “pervasive” to a game brings along that the game itself is being expanded “spatially, temporally, or socially” (Montola et al., 2009, p. 12), so that the location, time and participants are no longer fixed. This enhances the experiences of playing the game but in the context of everyday life (Montola et al., 2009). Furthermore, pervasive games, since they have no limits of time and space, are usually unplanned and emerge while being played. In a learning context, pervasive games minimize the gap that occurs between generalizing abstract knowledge and applying this to problems in the real world (Gustafsson et al., 2009).

3.1.3 Serious Games

“Serious games are full-fledged games without entertainment purpose” (Prince, 2013, p.168) but instead have the goal to educate people (Michael and Chen, 2006). They do that by bringing events from the real world into a game, as opposed to the concept of gamification which rather brings game elements into the real world. Serious games, as already found by Abt in 1987, “offer us a rich field for a risk-free, active exploration of serious intellectual and social problems” (Abt, 1987, p. 13). In addition, serious games, as often used for education, usually build on repetition and ways to compare results in order to increase the participant’s knowledge (Wood et al., 2014). Even though their focus is not set on fun, they can be seen as an enjoyable way to address serious problems with the aim to impart knowledge to the players.

3.2 Motivation

Motivation as being one of the main goals in gamification can be studied by immersing into human psychology. Motivation is also a driving force when it comes to human-computer interaction in public space, as the novelty of interactive displays also implied finding ways to make people use those (Müller et al., 2010). The essence of this paragraph is to explain different views on motivation, existing models and what it takes to motivate people.

Motivation defines “what goals people choose to pursue and how actively or intensely they pursue them” (Keller, 1979, p. 4). Studies about motivation then investigate “how different factors combine at a particular time to influence the duration, vigour and persistence of an individual’s behaviour in a given situation” (McKellar, 1966, p. 236). In short, they seek to answer the question of why we do what we do (Keller, 1979).

3.2.1 ARCS Model of Motivational Design

Motivational design links these theoretical aspects of motivation studies with actual procedures and practices applicable to improve motivation focusing on the context of learning (Keller, 1979). One model that is formed from this is the ARCS Model of Motivational design

introduced by Keller (1979). He defines four essential components for motivation: Attention, Relevance, Confidence, and Satisfaction. In order to focus the learner's attention on the content and to make him willing to invest more time on it, first of all, one has to generate curiosity and interest. This can be done by using surprise, challenging tasks or a variation in teaching methods (Poulsen et al., 2008). Further, to respond to relevance, the goals have to be identifiable for the learner and meet his interests and needs. Confidence is achieved by balancing the challenge, enabling the learner to estimate their chance to succeed (Poulsen et al., 2008) and by giving feedback. Satisfying a learner is another aspect of motivation and is gained with the help of rewards that stimulate intrinsic or extrinsic motivation (Bizzocchi and Paras, 2005).

Intrinsic motivation implies that people get engaged in an activity only for the sake of it, because they think it is inherently fun or interesting. Extrinsic, on the other hand, means people are motivated because they receive external rewards (Malone and Lepper, 1987). Adding rewards for good performance, in form of money, points or ranks on leaderboards, is a popular method for motivation within gamification. But one of the disadvantage of external rewarding is that it decreases or even replaces intrinsic motivation for an activity and as soon as this extrinsic motivation is taken away the negative impact on people's behavior appears (Nicholson, 2012). People's motivation to perform a certain task they have been rewarded for in the first place will then decrease. Therefore, to make people motivated in the long-run, focusing on the intrinsic motivation is essential, which is indeed addressed within most video games (Bozarth, 2011).

3.2.2 Taxonomy for intrinsic motivations

Similarly to the ARCS model but more extensive, Malone and Lepper (1987) define a taxonomy for intrinsic motivations in an education context, which can be divided into individual motivations and interpersonal motivations, the latter applying when more than one person is involved.

Individual motivations (Malone and Lepper, 1987)
Challenge: The least intrinsic interest is given with too easy or impossible activities, the level of challenge should rather be intermediate and continuous. Furthermore, feedback about the achievement of goals plays an important role.
Curiosity: "Curiosity is evoked through novel stimuli that present something unclear, incomplete or uncertain" (Müller et al., 2010, p. 1287). On the one hand, this includes sensory curiosity such as changes in light or sound and, on the other hand, cognitive curiosity, making people think they do not know enough.
Control: Motivation occurs when people feel in control of what they are doing and of their environment. Besides, they should be given the freedom to choose their actions at any time. Notably, it is the perception of control rather than actual control that creates a strong effect on motivation.
Fantasy: Fantasy enables the learner to break out of the limits of reality, transferring himself into imaginary situations.

Interpersonal motivations (Malone and Lepper, 1987)
Cooperation: In order to reach a certain goal, people have to collaborate, to solve tasks by combining their performances or scores.
Competition: Comparing each other's performances, for instance with the help of scores, stimulates the sense of competition and therefore motivation to perform better than the others.

Just like cooperation, it requires a certain goal. This goal could also consist of avoiding the competitor's success.
Recognition: Recognition implies that "the result of one's activities must be visible to other people" (Malone and Lepper, 1987, p. 244). This brings along that people want to have a certain impression on others which creates some kind of pressure and motivation to perform good in front of people.

These various motivational factors show a close link to games which feature certain of these elements and apply them to its context. This is why these factors are important to consider when aiming to address motivation within games and other activities. Nevertheless, one has to be aware that motivation varies with every individual, so there is no method that is universally applicable.

3.2.3 Self-Determination Theory

The Self-Determination Theory (SDT) by Ryan and Deci (2000) is another important approach to explain human motivation and personality as being based on the need to choose one's own behavior instead of having it determined by someone or something else. The authors also define three major psychological needs as a basis for self-motivation: competence, autonomy, relatedness. Further, there are two sub-theories that focus on intrinsic and extrinsic motivation. The former, Cognitive Evaluation Theory (CET), as more interesting for this thesis, implies that intrinsically motivating activities are the ones that "have the appeal of novelty, challenge, or aesthetic value" (Ryan and Deci, 2000, p.71). The conditions that cause this kind of motivation are highlighted as the fundamental needs of competence and autonomy which are supposed to be addressed in combination. Perceived competence can be achieved by providing positive performance feedback but people must also feel that their behavior was self-determined in order to create a fully intrinsically motivating experience. Besides, Ryan and Deci found that "choice, acknowledgment of feelings, and opportunities for self-direction" (Ryan and Deci, 2000, p.70) rather than external rewards or negative reinforcements like threats or deadline, enhance the intrinsic motivation as they make people feel more autonomous. The third factor, relatedness, was investigated to be influential when it comes to the creation of a secure relation.

3.2.4 Personalization

Personalization within the areas of information and communication technology (ICT) provides the user with the possibility to create a product, system or interface that fulfills his needs and makes it personally relevant for him (Oulasvirta and Blom, 2008). According to Oulasvirta and Blom (2008), the phenomenon of personalization can be described by making use of the basic needs defined in the Self-Determination Theory. The feeling of competence together with autonomy is increased when the user has more choice that allows him to adapt the system to his needs, make it more efficient and to feel more in control. In that case, the user being its producer and maintainer makes the content more personal as it also reflects his interests. Considering the need of relatedness, personalization highly affects other people rather than the user himself. Personalization can help to express the user's emotions and attitudes and make it visible to his environment. Referring back to Malone and Lepper (1987), it addresses the intrinsic motivation factor of recognition and the will to leave a certain impression. Furthermore, a personalized object can be seen as an identification for the user's self and as a statement to "mark his territory" which fulfills the need of control and being individual.

Specifically for games, personalization or rather customization, as choosing from a set of options, often involves the player's creation of characters and avatars as well as adaptation of the game environment. According to research by Teng (2010), enabling the player to create an avatar according to his preferences increases satisfaction and the immersion into the virtual world. Besides, the actual process of customization, is an essential factor for making a game enjoyable, as can be experience in games such as the Sims.

3.3 Interactions in public places

A public space is described as a "social space that is generally open and accessible to people" and "no fees or paid tickets are required for entry" (Public Space, 2015, para. 1). Streets and public parks are typical examples, but also public buildings like government buildings, libraries, cafés fit to a certain extend in this definition. People pass by, might stand for a while, perform different activities but their attitude shows no particular interest in the surroundings (Müller et al., 2010). This behavior relies mainly on three different factors: the non-ownership of the shared area, the relative anonymity among the crowd and the ensuing relationship to unknown people and public life in contrast to private attitude.

The first characteristic of such a place is that it belongs to everyone and no one in particular at the same time (Müller et al., 2010). By law it is often the property of the government, the city or a specific organism that manages it which means, individuals do not own it even though they can freely use it. It implies at least two different problematics linked to the management of the resources available at the place. Firstly, people do not feel any responsibility for taking care of the place. This attitude can be related to the psychological topic of diffusion of responsibility. The more people there are the less each one is likely to take action if something happens (Cherry, 2011). Here the focus is not set on specific events but rather on a wider perspective, caring about the consequences of individuals' actions to preserve the area in good conditions. The second problematic is the over-exploitation of the shared resources, as described in the tragedy of the commons (Hardin, 1968). People do not pay attention to their consumption there since they are not rewarded when doing this and free access to resources even incite them to over-consume.

Public places do not have an impact only on people's attitude towards the place but also towards others. Different level of people based on the scale of acquaintance can be defined. People we already know and interact with are not part of the topic here, so they will not be described any further. In public places the most obvious category of people that we are likely to meet is the strangers, the ones whom we do not know and whom we do not feel any connection to (Simmel, 1950). Interactions with them are very unlikely to occur and all together they form an inconsistent crowd with no figure. By definition they are the others, enabling defining ourselves in opposition to them (Bauman, 1998). However a special category, halfway between strangers and acquaintances, has been defined by Milgram (1977): the familiar strangers. These are the ones that look familiar because one sees them very often in public places but whom one almost never interacts with.The relationship to them is more complex than with the previous category. While strangers are simply ignored, familiar strangers are recognized but "both parties agree to mutually ignore each other, without any implications of hostility" (Paulos and Goodman, 2014, p. 223). Three main keywords are important to characterize them: people belonging to this group are "observed", "repeatedly" and "without any interaction" (Paulos and Goodman, 2014, p. 223). This specific category is of bigger importance in our study because this slight difference in the relationship induces the possibility of an interaction. This is especially true in case of an extraordinary event or of an

encounter in a totally different context (Paulos and Goodman, 2014). These parameters are interesting to take into consideration, since the introduction of gamified elements could be seen as such a trigger and enable certain behaviors in the crowd that would not occur otherwise.

Being in a public place influences also one's attitude on an individual level. The theory of the Presentation Of Self developed by Goffman (1959) brings a special perspective on this. Thoroughly using the metaphor of the theatre, the claim is that people wish to make a certain impression on others, which especially applies when interacting in public places. The term performance describes "all the activity of an individual which occurs during a period marked by his continuous presence before a particular set of observers" (Goffman, 1959, p.14). It happens in the front stage, clearly distinguished from the backstage, which is a place to relax. The border between these two zones depends on the relationship between the individual and their audience - the others, co-participants or observers. In a public place, the individual is constantly on the front stage and the access to their backstage is prevented. People perform a role either because of their function, like a policeman, or because they prevent themselves from doing some gestures, "which they believe would contradict their role" (Müller et al., 2010, p. 1288). The social and personal pressure on what is acceptable to do is higher than in a private environment. These aspects are essential to consider when designing for a public place, to reduce the threshold from being curious and interested to actually perform the required tasks.

3.4 Behavior change

Literature about behavior change is comprehensive, therefore, only two main models applicable within the area of gamification will be presented - the Theory of Planned Behavior and the Transtheoretical Model (Glanz and Rimer, 2005). They are very commonly used and therefore have proved their efficiency.

3.4.1 Theory of Planned Behavior

The Theory of Planned Behavior assumes that behavior is mostly determined by behavioral intention and explores the influence of different parameters, such as attitudes, subjectivity, beliefs and perceived control on the latter (Glanz and Rimer, 2005).

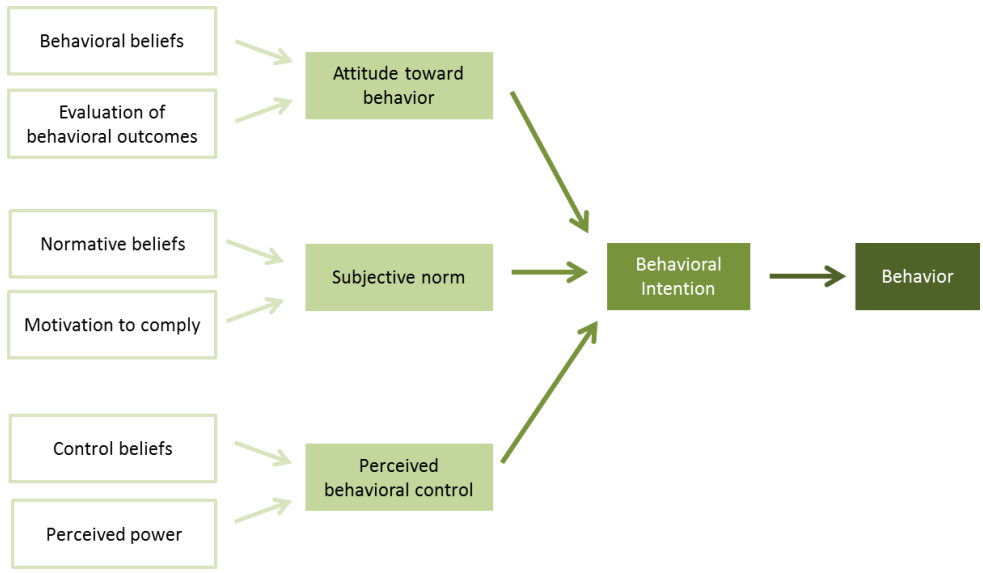

Figure 3.1 The Theory of Planned Behavior (adapted from Glanz and Rimer, 2005, p. 18)

The model has been developed by Ajzen (1991), based on a previous model, the Theory of Reasoned Actions by Fishbein and Ajzen (1975). It is helpful when it comes to understanding the behavior's basic mechanisms. Behavior, behavioral intention, attitude toward the behavior, subjective norm and perceived behavioral control are key concepts, whose relationship is described in figure 3.2. The Attitude toward the Behavior is the personal evaluation of the behavior and depends on the consequences of the behavior in the individual's understanding and their evaluation. The Subjective Norm is the personal perception about what society, culture and environment think about the behavior and the will to comply them. The Perceived Behavioral Control is the personal belief of self-ability to perform the behavior, based on the individual's perception of control and on external factors that could help. All three together influence the behavioral intention, with various degrees dependent on the intended behavior and the person. This intention in turn, once it is strong enough, will trigger the behavior change. The model is a powerful tool, whose categorization simplifies the problematic by considering from different perspectives. This overview helps to prioritize the biggest obstacles and to target the levers to activate when aiming for modifying a behavior.

3.4.2 **Transtheoretical Model**

The Transtheoretical Model is a model developed in 1983 by Prochaska and DiClemente (Glanz and Rimer, 2005), which describes the behavior change as a process requiring five stages. The following table shows a general overview of those stages as well as potential strategies that can be used within them. Once the stage the individual is in is identified, the adequate response can be developed and personalized to trigger the evolution towards the next step.

Stage	Definition	Potential Change strategies
Precontemplation	the person has no intention to change in the foreseeable future	increase awareness of need for change
Contemplation	seriously considers changing, but has not committed to taking action	motivate, encourage making specific plans
Preparation	intends to take action soon and has unsuccessfully taken action until now	assist with developing and implementing concrete action plans
Action	has performed the desired behavior consistently recently	assist with feedback, problem solving, social support and reinforcement
Maintenance	has consistently performed the desired behavior for a long period of time	assist with coping, reminders, finding alternatives, avoiding slips

Figure 3.2 Stages of the Transtheoretical Model (adapted from Glanz and Rimer, 2005, p. 15)

3.5 Persuasive technology

The Study of Persuasive Technology has been initiated by B.J. Fogg (2002) under the keyword of captology (Computers As Persuasive TechnOLOGY). Persuasion can be understood in many ways in psychology but the focus here is set on the "attempt to change attitudes or behaviors or both (without using coercion or deception)" (Fogg, 2002, p. 15). The border between persuasion and these two other terms might sometimes be very thin, but as

long as no force and no misinformation or false emergency is reported in the methods used, it is very likely that they stay within the limits of the definition.

Persuasion is originally a typical human-to-human interaction, but technology can sometimes take over that role. However, it introduces a certain unbalance between the two parts, since only the user can be persuaded; this relationship to a technical system is not reciprocal (Fogg, 2002). On the other hand, the combination with technology offers some advantages over humans (Fogg, 2002). First of all and most obvious is the greater persistency and anonymity. The technical aspect also enables the management of huge amounts of data that a human brain could not handle and therefore can reach the user in different ways and scales. Finally, technology is more likely to be pervasive and even to be at some places that human cannot access to. Yet, persuasion through technology is still controlled and implemented by humans. The outcomes are mostly planned but side-effects can appear. Captology focuses only on the former, when the computer product has been designed for this purpose (Fogg, 2002). Consolvo et al. (2009) also include in their definition the impact of the technical support in the daily life, since the ultimate aim is to be integrated in everyday actions.

Designing technology to persuade is possible at different levels; Fogg (2002) distinguishes two of them. Macrosuasion refers to products designed specifically with the persuasive effect as a goal in mind while Microsuasion integrates this component as one part of the final implementation. Systems created to change people's behavior and designed to perform that goal belong then in the first category, even if the means used do not explicitly give away the aim. Fogg (2002) further clusters the different forms of technology into three categories: tool, medium and social actor. The strategies used to persuade the user depends on the chosen role. A tool increases capability by reinforcing and helping to do some actions or enabling some others that would otherwise be impossible to realize. The persuasion relies here on the easy accessibility of the experience. A medium provides experience with simulations that make people try out, explore and discover situations. Finally, a social actor creates relationship making people interact with it like if it were a living being. The choice of one or another depends on the target group and on the levers to activate to persuade them to change.

This last framework is however not very helpful when it comes to actually designing the product, as highlighted by Nakajima and Lehdonvirta (2013). Therefore several researchers came up with more adapted guidelines.

Consolvo et al. (2009) for example distinguish eight non-exclusive aspects of a product that designers have to take into account: Abstract and reflective (the raw data should be used to provide abstract feedback, since it is more flexible), Unobtrusive (the product should be easily ignored, so the user's task is not interrupted), Public (the data should be presented in a way that it does not bother the user to make it visible to everyone), Aesthetic (an appealing installation is always better to draw interest), Positive (the positive reinforcement should always be used rather than the negative one), Controllable (the manipulation of the data must be easy and the user should know who has access to it), Trending/Historical (the past behavior should be saved and the user able to track it) and Comprehensive (many behaviors can fulfill the goal, designers should not focus on only one and punish the user for not doing it).

Consolvo et al.'s and Fogg's work have the disadvantage to focus on individual persuasions, when the person is already convinced of the benefits of doing the action. They are already in the stage contemplation of the transtheoretical model. In public buildings, as already explained, people do not feel bound enough to anything around to care about the environment.

They are still in the earliest stage of precontemplation which means the designer needs to integrate diverse aspects as presented by Nakajima and Lehdonvirta (2013). They insist on the importance of the choice of an incentive system to draw the individual's attention and to keep their motivation up. This includes considering both target group and context: physically, psychologically, socially, economically and ideologically. Just as Consolvo et al. (2009) explain, the digital representations have to be meaningful and polished, metaphors and aesthetics are of prime importance, and a special attention has to be given to the feedback loop. Besides, negative stimuli can be appropriate as long as they are balanced, and the duration of the study has to be taken into account when designing.

Another point of interest when talking about persuasive technology is the shape the final product will take on. More than ten years ago, Fogg (2002) envisioned that mobile devices would be the keystone behind the idea of persuasive technology. And indeed people are currently very mobile so an efficient way for a persuasive device to fulfill it mission is to be brought everywhere. Their strength is to be "at the right time and place" (Fogg, 2002, p. 183). It can be extended to the concept of Ubiquitous Computing, which highlights the presence of technology everywhere we go (Weiser, 1991). This term includes nowadays all kinds of smart devices, from computer to smartwatch to smart fridge. Persuasion depends on the context and sometimes a fixed installation is more efficient, as Nakajima and Lehdonvirta (2013) mention it, especially within public buildings. It guarantees even more anonymity since it does not belong to and is not connected to anyone. Ham et al. (2012) raise an important question about the nature of the interaction itself. By using the environment, it is possible to unconsciously persuade the individual. Even though the aim of the study is not to manipulate people, these findings highlight the importance of an environment predisposing well the users to be persuaded.

Behavior change through technology has been studied under many tags, including captology and gamification (Nakajima and Lehdonvirta, 2013), which explains the thin border between these two terms.

4 Methodology

This chapter shortly describes the terms Interaction Design and Human Centered Design and will then give insights into the Design Thinking Process and different methods that can be applied in this field.

4.1 Interaction Design

Interaction Design has various definitions, one of is it “designing interactive products to support people in their everyday and working lives” (Preece et al., 2002, p. 8). Interaction designers work on creating or enhancing the user experiences and usability of a product, service or system (Preece et al., 2002). Usability, in particular, is defined as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use” (ISO 9241-11).

4.2 Human Centered Design

There are several design approaches that focus on different aspects. Human Centered Design (HCD) is devoted to understanding human‘s complexity defined by behaviors, needs, feelings, attitudes and emotions. It does not simply consider the individual as a user but aims to create a less stereotypical image of people (Redström, 2006). One of the main models from psychology which HCD relies on is Maslow’s hierarchy of needs pyramid (1943), which structures humans' needs with physiological needs in the bottom and self-esteem at the top. Another component of this approach is gaining a good understanding of the user's habits, environment and the context of use (Normark, 2014). In practice, this means involving the individual all along the design process and analysing the insights provided in the light of people’s surroundings factors. The downside of considering all these parameters is that the final design might be too specific and complex (Norman, 2005), therefore it has to be used cautiously.

4.3 Design Thinking Process

To offer designers a guideline to follow in their design process, diverse toolkits have been developed. The LUMA Institute, for instance, developed a toolkit that divides the whole process into three steps: Looking, Understanding and Making (2012). Looking focuses on gathering data and evaluation from people, while Understanding analyses this feedback and Making implies ideation and prototyping. Similarly, the design thinking process by Simon (1996) (figure 4.1) is structured into seven stages, including Understand, Observation, Definition, Ideation, Prototype, Testing. In both approaches iteration is essential, which makes the designers move back and forth between these different stages and develop the concept further based on user feedback from tests.

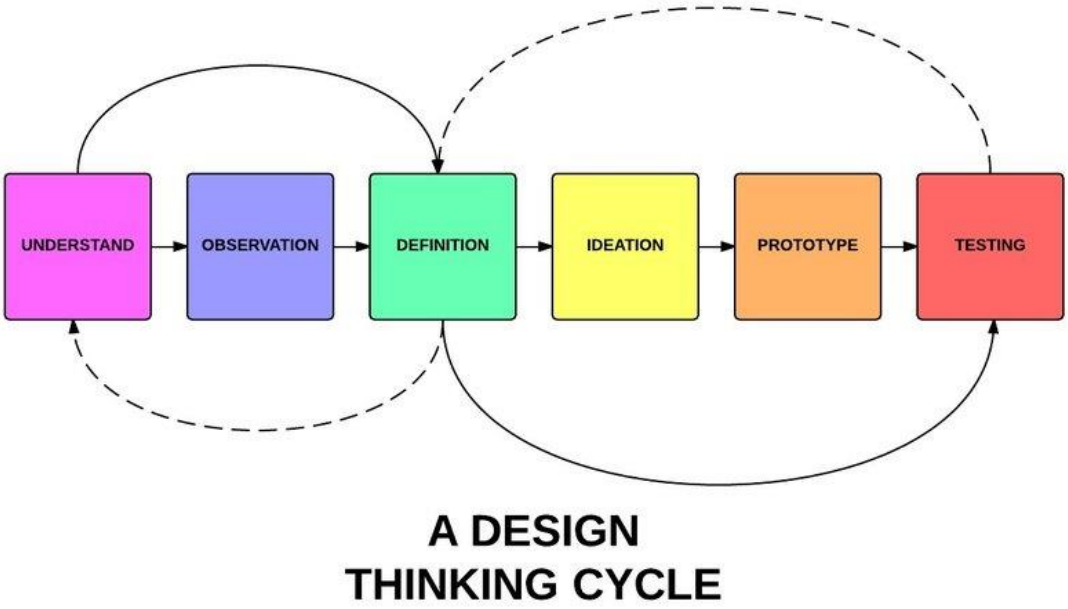

Figure 4.1 Design thinking cycle by Simon (1996)

Identifying a first version of the research questions is usually one of the first things to start a research. Once this is formulated, a literature review helps to find out about ideas and research within the chosen area (Bryman, 2012). Literature reviews are not only essential for writing academic papers, "but are also a useful component of any design project, to collect and synthesize research on a given topic" (Martin et al., 2012, p. 112). It is part of Secondary Research, in which information from already existing data, such as books, research and conference papers is collected. Reviewing literature provides the researcher with information about what has been done before and helps to find the direction the new research should follow (Martin et al., 2012). Often it reveals controversies or unanswered research questions which can lead to a refinement of the own research question (Bryman, 2012). The main advantages of this literature research are that it teaches about various theoretical and methodological approaches to investigate the research question and it enables to learn from and avoid mistakes that other researchers might have done before (Bryman, 2012).

4.4 Ideation

Brainstorming means generating thoughts which is undoubtedly the core of all ideation processes. In order to let us "think expansively and without constraints" (IDEO, 2008, p. 56), some rules have been established by IDEO (2008) that include: do not judge but rather encourage wild ideas, make them visual and go for quantity. Several methods for brainstorming exists, such as the workshop technique Design Charette (Martin et al., 2012). The idea behind this method is that several groups elaborate ideas separately on their workspace. After a predetermined time, one person of each group joins another one, bringing with them the best idea of their group. It can then be integrated into the ideas developed in the next round. In the end, one will have several different ideas and low-fidelity prototypes that together explore a specific problem. Bodystorming can be seen as a physical variation of brainstorming, often achieved with role-playing or simulations (Martin et al., 2012). It can capture "a realistic scenario of use through immersive acting in a simulated context"(Martin et al., 2012, p. 20), in which the design team can set themselves in the position of the user. Props can be used to represent products or environments in which the participants can improvise.

4.5 Prototyping

"Prototyping is the tangible creation of artifacts at various levels of resolution" (Martin et al., 2012, p. 138), which can range from simple paper mock-ups, to cardboard or clay versions and more elaborated prototypes that look and feel like the final product. Prototypes are a way to test different ideas and develop them further, without having to spend many resources (basically, time and money) on their implementation. Generally they are used for communication within a design team or to visualize and make tangible concepts for the client or user which enables those to give valuable feedback. In the early phase of a design process, low-fidelity prototypes are introduced to iterate and refine different ideas (IDEO, 2008) without focusing on aesthetics. When testing an early prototype with users the Wizard of Oz technique helps to simulate a functioning system. In this case the researcher playing the wizard is usually not seen by the participants, instead he is playing behind the scenes and manipulates the prototype. The methods is used in order to make the user experience a prototype at its early stage without having to implement a more polished and interactive version, which saves money and time (Martin et al., 2012). More elaborated high-fidelity prototypes are usually similar in appearance and sometimes also functionality of the actual product (Martin et al., 2012). Users or clients those versions are presented to are able to give more specific and detailed feedback on "aesthetics, form, interaction, and usability" (Martin et al., 2012, p. 138). Experience Prototyping (Martin et al., 2012) is one possible method. Similar to bodystorming it implies an active participation of the design team and the users by simulating a scenario in which the product would be used. In this way the designer can "try things out and gain critical feedback based on realistic scenarios" (Martin et al., 2012, p. 78). The implemented prototypes are then used to make an experience.

4.6 Field Study

A "field study is an experiment performed outside the laboratory, in the 'real' world" (Shuttleworth, 2010, para. 2). Usually, an independent variable is introduced that is being changed in the experiment. The dependent variable represents the effect of changing the independent variable and what is to be measured with the study (Blakstad, 2008). As compared to a laboratory study, a field study gives insight about real life behavior of the participants. An experiment conducted in a well-controlled environment, on the other hand, enables the research to replicate it as well as control extraneous and the independent variables (McLeod, 2012). Qualitative data within a field study is usually collected with the help of interviews, questionnaires or observations whilst the dependent variable can reveal quantitative data.

4.7 Interviews

Interviews are conducted "to collect firsthand personal accounts of experience, opinions, attitudes, and perceptions" (Martin et al., 2012, p. 102) and usually result in qualitative data. They either follow a structure with predefined questions or are set up unstructured, meaning that only the general topic is defined. The latter gives both the interviewer and the interviewee more freedom and is usually seen to be more natural and comfortable. Yet, the outcome depends highly on the skills of the interviewer and could also lead to a conversation that is off topic. Besides, structured interviews are easier to analyze because they all follow the same course.

One form of interview is the focus group (Martin et al., 2012) in which a small group of people can relatively freely discuss about a certain topic whilst being guided by a moderator. But one has to be aware that people behave differently in groups compared to being interviewed individually. Discussing in a group also involves thinking critically about different perspectives as well as arguing for personal statements as most likely not all participants agree on everything.
Whilst conducting one focus group seems to be less time and cost consuming than several one-to-one interviews, some argue that they give less qualitative results. Schirr (2012) claims that several researchers found that brainstorming in groups produces fewer and lower in quality ideas than individual interviews. But again the outcome of the focus group is closely linked to the skills of the moderator and even more the characteristics of the participants (Kidd and Parshal, 2000).

4.8 Observations

An observation is an important support for interviews, since people often do not say what they actually do (IDEO, 2008) which could be because they are not aware of it or because they do not want to reveal something. Important aspects that can be found while observing are work-arounds and adaptations made by the users, changes in behavior and body language (IDEO, 2008). Yet, these findings have to be interpreted carefully by the researcher. Two different methods can be mentioned here. Fly-on-the-wall observations are unobtrusive, meaning that the observer does not participate or interfere in people's actions. This distance can be seen as an advantage since it reduces bias and prevents the observer from being influenced by people's behavior. On the other hand, the observer is not able to investigate further the motivation behind people's behavior (Martin et al., 2012). Making use of a Participant Observation, results in a closer connection of the researcher with the participants. It implies becoming an active part in the group or context to be observed and can therefore have hands-on experience of certain situations (Martin et al., 2012).

4.9 Analysis

The quantitative or qualitative data collected with the above mentioned methods, finally has to be analyzed in order to be able to present valuable results. Qualitative data gained with interviews and observations is processed regarding certain categories and codes, usually termed Content Analysis (Martin et al., 2012). This can result in a quantitative outcome, such as a number of words and phrases, but also in specific patterns. The KJ Technique can be used to create group consensus by listing all the participants' different ideas and thoughts and then organizing them. Generally, this method is involves everyone writing down silently any issues, opinions or ideas on post-it notes and then to categorize those together in the group to get an overview of the general situation (Martin et al., 2012). This kind of Affinity Diagramming is also helpful when analyzing data from interviews and observations and includes having one post-it for each finding and a following grouping of those. In both cases, it is a bottom-up approach, which means that the categories are not formulated beforehand but emerge from the clustering of the findings (Martin et al., 2012) and are arranged and adapted within a group discussion.

Quantitative data is analyzed with the help of statistics which are numbers that are constructed in order to describe a set of data. This social phenomena can be described with regards to identified relationships and hypotheses can be tested. Quantitative data analysis aims to

discover variations and relations of the different measurement which can also reveal certain patterns (Chambliss and Schutt, 2015).

4.10 Initial planning for the project

The initial project plan can be seen in figure 4.2. According to this the process based on a human-centered approach and was divided into four phases. Phase 1 would focus on literature research and short interviews at different places on the campus followed by a definition of the research question. Further, Phase 2 would then include interviews and observations at cafés which should help to find an appropriate location for the later field study. Within the same phase a workshop was planned to be conducted to ideate concepts for a game and feedback system. The structure of this workshop was intended to be divided into two parts, the first being dedicated to the interactions with the technology (implied by the real-time aspect), the second part focusing on the game mechanics. We imagined to use bodystorming in the beginning and then possibly apply a Design Charrette to come up with basic game mechanics. This method implies that several groups of people create ideas that are then presented to the other groups which will use those as a base for another session of brainstorming (Martin et al., 2012). Followed by this, Phase 3 was the prototyping phase including several iterations based on the input from the workshops. The low-fidelity prototypes of the game were planned to be used for several rounds of playtesting. We aimed for three iterations but were already aware that this would depend on the outcome of the individual iterations. Since at that stage we were considering some kind “feedback system” instead of a visualization, the implementation of the high-fidelity prototype included one for the feedback system with and one without game-elements. This was planned to take about five weeks. Finally, Phase 4 dealt with the user field study which was not very defined at that stage. It was imagined to have three studies at a café, one serving as a reference, and the others introducing the two prototypes. We further had the thought to either have the test the two prototypes at the same time but at different cafés or to test them at one café and one at a time. Interviews after the study were imagined to give more qualitative feedback. Furthermore it was planned to send out questionnaires to reach a wide range of people that could evaluate the two prototypes. At the end of this phase, we aimed to do a thorough analysis and the formulation of recommendations.

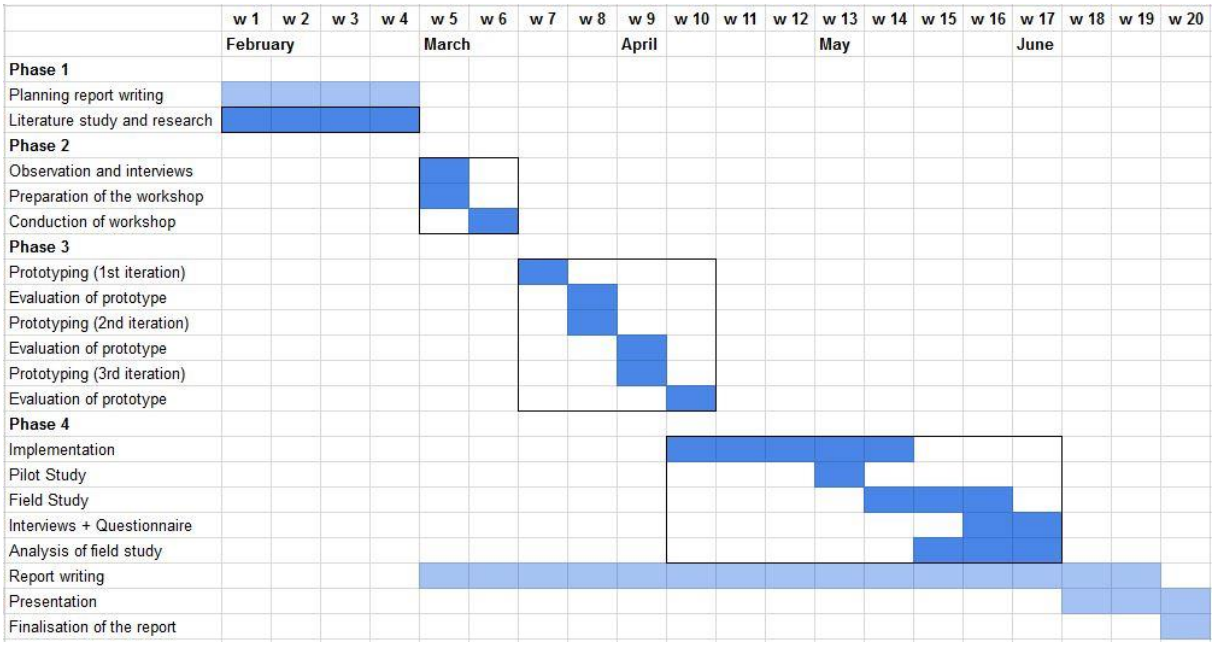

Figure 4.2 Initial time plan

5 Process

This chapter focuses on the entire design process of this thesis and the outcomes of the different stages.

5.1 General approach

Our whole process was aimed to create a concept and prototype in an iterative way and by involving both users with and without previous knowledge in Interaction Design and the field of game development. A human-centered approach was chosen since the subject of the research area implied a focus on human behaviors and their psychological foundation. Besides, the structure process was inspired by the LUMA toolkit (LUMA Institute, 2012) and the design thinking process by Simon (1996). Based on those the first steps focused on Looking, gathering data from people about the current situation, analyzing and Understanding it next, also considering previous works. Those findings were then applied to the Making phase, which includes ideation and prototyping and testing. In our case, the steps were more interwoven since feedback from people was collected at several stages. Furthermore, a main focus was set on Making which implied several iterations especially of the concept before the implementation of the final prototype. At all stages, various meetings with both our supervisors helped to stay focused and also to open up new perspectives both methodology wise and technical wise. As one method of keeping track of our progress we initiated a blog, accessible via http://masterthesisdiary.blogspot.se/, which we updated with weekly summaries, results from interviews and some ideas and reflections. The blog writing was kept up during the early stages but was later dismissed. While working on the project, notes were actually taken in documents dedicated to each stages and it was redundant to repeat everything on the blog. There was another purpose for the blog, which was communicating with our supervisors and keeping them updated about the status of the project, but the frequency of the meetings made it less relevant.

In the following section the different phases will be described that eventually led to the user study and the results of this thesis. Figure 5.1 gives an overview of the process. The basis for the thesis was built in Phase 1 which was about defining the research area and gaining background knowledge from previous research as well as theoretical foundations. This literature study was supported by first interviews and observations that caused a slight shift in the focus and ended with the elaboration of our research question. In Phase 2 a more specific scope of the thesis was defined by collection data about the current situation in the chosen context of a café. This included observations and interviews at potential locations for our user study as well as collective brainstorming in a focus group with Interaction Design students. After that, Phase 3 was focused on iteratively developing a concept and on prototyping, both with the involvement of potential users. Based on the elaborated concept and some low-fidelity prototypes, a high-fidelity version of a prototype was implemented in Phase 4 with the aim to test this during the user study. This user study was conducted in the field and represented Phase 5. The last phase then also included the analysis of the study and the formulation of our findings.

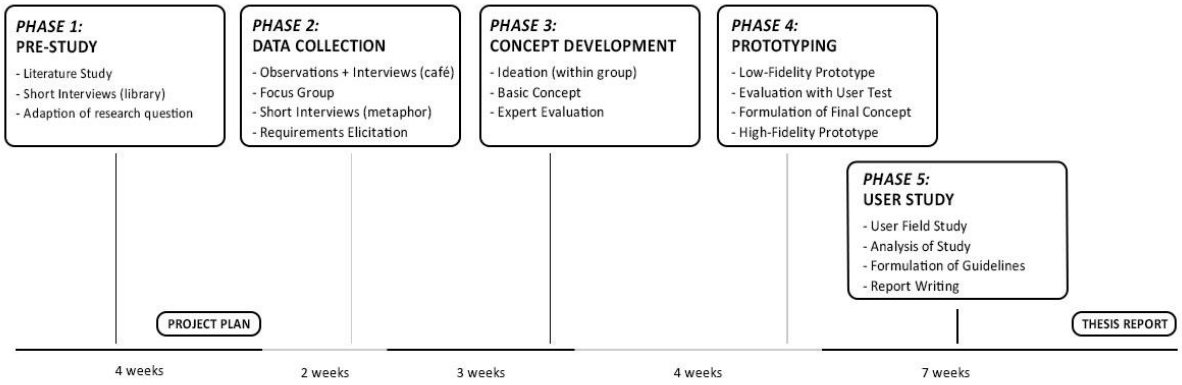

Figure 5.1 Overview of the process divided into 5 phases

5.2 Phase 1 - Preliminary Study

At the beginning of the thesis, our understanding of the problem was superficial, not only because we had not started to investigate it but also because the research problem was unfocused and very broad. The potential behavior to change and the means to measure it were not defined at that stage, preventing us from analyzing further a few points. Therefore we needed to explore the topic through literature research.

5.2.1 **Literature Study**

As a start for the whole process, a literature study was conducted in order to get an understanding of the current development in the area of gamification as well as in underlying psychological theories. The literature that was reviewed consisted of scientific papers as well as books and online articles. In general, the literature research approach included starting with the phenomenon of gamification on the one hand, and behavior change on the other hand, since these had been the main aspects we were aiming to address. In both cases, the reading of the material lead to investigating their references, which step by step led to other aspects to consider. All those resources were divided into several categories some of these including gamification in general and gamification in the context of energy consumption as well as other kinds of interventions in that area. For this part we found various research projects that had already been realized, at that the names of Gustafsson and Bång appeared several times (Gustafsson et al. 2009; Bång et al. 2009), who investigated different games to address energy consumption issues at home. Besides, findings showed that, for instance, collaboration and competition were effective motivational factors (Gustafsson et al., 2009; Huber and Hilty, 2015), which reappeared at later stages within our process. As for gamification we found several critical articles about it, for instance by Deterding (2014) or Nicholson (2012) who demanded to step away from only making use of points and badges but rather to create a more meaningful game experience with the help of gamification. As pervasive games and serious games are closely linked to gamification those concepts were also part of our research. Even though one version of the prototype that emerged with this thesis was categorized to be a gamified system, it does have influences from these other concepts and is difficult to be clearly distinguished. Nevertheless, it will be referred to as a game as of now. As the basis of the study, the definition that makes a visualization distinct from a game is another aspect to be clarified. Even though Nakajima and Lehdonvirta (2013) estimate that gamification can include “technologies that aim to change behavior” (p.1), they prefer using the term “persuasive ambient mirror” for all their examples, mostly simple feedback systems that do not require much participation from the users. In our understanding, the differentiation

between gamification and visualization resides therefore in the active and voluntary participation of the users in the game.

Going through all these results of projects in the area soon made obvious the need to investigate underlying theories of motivation, interactions in public places, persuasive technology and clearly behavior change. Investigating motivation made us look into rather old but still valid sources such as the ARCS Model of Motivation Design (Keller, 1979) or the Taxonomy for Intrinsic Motivations (Malone and Lepper, 1987) which highlighted the importance to focus on intrinsic rather than extrinsic motivation. Within the aspect of behavior change, several existing models were found, whereof two were regarded more detailed, with the aim to find out which could be applied to our thesis. These were the Theory of Planned Behavior (Glanz and Rimer, 2005) and the Transtheoretical Model (Prochaska and DiClemente, 1983).

Both kinds of references, the research projects as well as basic psychological theories, gave a profound background knowledge which we would base the further process on. Additionally, several design methods were studied in order to decide on an appropriate approach, including Universal Methods of Design (Martin et al., 2012), the Human Centered Design Toolkit (IDEO, 2008) and the Handbook of Human-Centered Design Methods (LUMA Institute, 2012). The literature study further enabled us to define the research area and a first version of a research question.

5.2.2 Context and target group

At that early stage, decisions were also made regarding the context and target group we would address with the thesis. Besides, it was the aim from the beginning to conduct a user study in the field, in which the high-fidelity prototype would be tested with actual users and in the intended context of use. Ensuing from the research area of the TRIBE project different public buildings in Gothenburg were considered such as a shopping mall, gym, library or university. Considering the accessibility and the user field study, the context of a university campus seemed most appropriate also since we ourselves were included in the target group and were familiar with this environment. As mentioned, the target group of this thesis then was narrowed down to students on a campus, which we imagined would be easy to get hold of when searching for participants and to address with a game-like intervention. The main library of Chalmers University of Technology was chosen to be looked at more closely as it seemed to be a place students would visit frequently to spend quite some time but also where potential issues concerning sustainability could exist.

5.2.3 First interviews

As a next step having started with the literature study short interviews with groups of students were set up at the main library on the Chalmers campus Johanneberg. They aimed to understand the current situation and to reveal possible existing problems regarding sustainability in this environment which could be addressed within this thesis. The interviewees were both female and male Chalmers students and frequent users of the library. The interviews themselves took no longer than 10 minutes each and were structured with five pre formulated questions that were posed to all of the interviewees (see Appendix A). These included what problematic and unsustainable behavior the students have already experienced or could imagine in this environment, what they expect others to behave like in this public place as well as if and how they contribute to a sustainable environment in the library. Furthermore, one librarian and one employee of café at the library were briefly interviewed individually about their impression of the students' behavior concerning the environment at

this place. Another interview was also conducted with Bengt Bergsten, the Energy Strategist of Chalmersfastigheter AB, which is the company owning most of the buildings of the Chalmers campus. This was done to find out whether we would have access to data about energy consumption in different buildings of the campus which could support findings from the user field study.

The student interviews gave the insight that apparently there are no major problems concerning sustainability at this place. Possible problems that we had imagined and listed before these interviews included recycling, the noise level, and the consumption of paper in the toilets or with the printers. Yet, most of the interviewees claimed that people, in fact, follow these unspoken rules of respecting the environment. This was supported by the answers from the interviews with the staff. The interview with the Energy Strategist revealed that there are only few energy meters installed at certain buildings such as Saga on Lindholmen campus from which we could indeed get data about the daily consumption of water and electricity but which would not fit with the buildings we intended to do the study in. Nevertheless, one statement of the employee of the café drew our attention. She mentioned the high consumption of paper cups and that even people who stayed at the café would rather use papers cups than the reusable ceramic cups the café provides. After discussing the rather disappointing outcome of the other interviews we came back to this statement and in the end it helped us shift our focus. From that stage the whole process was directed towards a more specific aspect within the area of sustainability in public places. Having a more narrowed down starting point then enabled us to investigate this context more thoroughly with the aim to apply the results of this study to other contexts.

5.3 Phase 2 - Data Collection

After we shifted the focus, the research question was also slightly rephrased and specified to investigate gamification for behavior change related to the consumption of paper cups in campus cafés. In order to have a better understanding of the current conditions and potential issues within the new scope, interviews of customers at the cafés potentially electable for our study and a brainstorming session were conducted. The processes are described in the following paragraphs.

5.3.1 Interviews and Observations

Several interviews were conducted at three different cafés at the campus of Chalmers Johanneberg, Café Linsen, Café Hedvalls and Café Bulten. The interviews were semi-structured meaning that the same set of questions were asked to every interviewee with the possibility to ask further questions and to go into details if required. Furthermore, it was attempted to perform the interviews rather informal and in a familiar environment so people would not hesitate to share information and valuable insight. They were aimed to find out more about the use and consumption of the different cups. At each location one interview with an employee of the café and one interview with a group of customers, 2 to 4 students, were held (see Appendix B). They were selected so we would get a perspective from users of paper cups, reusable cups from the café and users with their own cups. Questions for the customers focused on what cups they usually used and why. The issue of bringing own reusable cups to the café was another aspect we found interesting to investigate, since this is already promoted by the fact that there are special reusable cups to buy at different locations on the campus. These editions of KeepCups allow the students to get a big coffee for the price of a small one if they bring their own one. Therefore, we also asked if they knew about the possibility of bringing their own cup (not only this KeepCup) as well as if they could imagine

potential incentives that would make them consider bringing their own cup. Questions for the staff of the café dealt with what kind of cups are provided at the café and whether or not they accept people bringing their own cup. We also asked which kind of cups are used most often and how many paper cups are being used every day. Besides, they were asked to describe the process of selling coffee and their different tasks in order to make sure the later user study and introduction of the prototype would not interfere with their work.

In general, the students we asked who were holding paper cups claimed they would do this for taking the coffee to another place because it is handier. Nevertheless, when asked, they were actually sitting at the café with paper cups and explained that in some case they would not know if they would stay long enough to finish the coffee at the café. The interviewees holding ceramic cups gave reasons such as the better taste of the coffee and the personal concern about the environment. Even though it was not possible for the staff to give us an exact number of the consumption of paper cups, one employee at Café Linsen gave us her personally estimated number of around 500 paper cups used per day but she could not state the amount of reusable cups on the other hand.

Along with the interviews, observations at the same locations were done with the aim to get an impression of people's behaviors as well as the general conditions in the cafés. This helped to find out more about what cups and how these cups are used by the customers. Additionally, we could investigate whether certain conditions at the cafés would encourage the use of one over the other kind of cup. Parts of the observations were conducted as participant observations, which included ourselves to be customers at the café, purchasing coffee and using the different kinds of cups. At the same time, being seated in the cafés among the other customers allowed us to discover some noticeable behavior. These unobtrusive observations complemented the statements from the interviews in which the interviewees might not have revealed everything.

Generally, we found out about different conditions at the cafés regarding the kind of cups they provide. At Café Linsen, for example, they do have ceramic cups but they are a bit further away with the other dishes and therefore not as accessible as the paper cups which are placed directly next to the coffee machine. The students that were interviewed also mentioned that they did not even know where the reusable cups are placed. This issue was underlined by the observations that a noticeable amount of customers used paper cups while sitting at the café. At Café Hedvalls, on the other hand, no ceramic cups are provided any longer, since there were issues that many cups have not been returned. However, apparently people often bring their own cups there. Behaviors such as people reusing their paper cups have also been investigated. But, in contrast, according to the staff some people use two paper cups to make sure nothing leaks and in order to protect their hands from the hot content. Finally, at Café Bulten, reusable and small paper cups are placed next to each other at the cash register whereas the big sized paper cups are available upon request. Many students stay within the café or in the big study room nearby, but the policy of the café does not allow the customers to take the ceramic cups with them outside the café. That is why the majority uses reusable cups inside the café but paper cups in the room next to it.

At the three cafés different incentives are already used that might have an influence on changing people's behaviors. At Café Bulten, for instance, people taking their coffee in a ceramic cups in the café get a free refill, and people reusing their paper cups at Café Hedvalls get a refill for 5 Swedish Krona. In all places the price of a big coffee is reduced to the price of a small coffee if using a KeepCup. Price reductions was the most stated motivation among

the interviewees which would make them consider bringing their own cups. Many people asked did not know of the possibility to bring their own cup and to even get price reductions with a KeepCup. Yet, for the interviewees who were aware of it, the inconvenience to carry the cup in their bag and to remember to bring it seemed to be the reason for them not to do so. Only one of the interviewees stated he would consider bringing his own cup, yet, in that case it would be a thermos cup which he would fill with coffee at home already.

Additionally, the short interviews were analyzed regarding advantages and disadvantages of the three different kinds of cups: paper cup, ceramic cup and KeepCup as being representative for personal reusable cups. The according statements of the interviewees were noted on post-it notes that were then arranged on a whiteboard under the three categories (figure 5.2). This method enabled us to better understand why certain cups are preferred over others and to think about what could be done in order to change this. The advantages of the paper cups, for instance, included the transportability, the possibility to get a cheaper refill and the fact that they are a 'safe choice'. One main argument for the paper cups, as seen during the interviews, was also simply the laziness of people. On the other hand the advantages of the ceramic cups also outweighed their disadvantages, including the free refill and the better taste. The negative aspect here was represented by the issue of people not returning the ceramic cups and that it was not allowed to take them outside the cafés. Lastly, the statements about the KeepCup were mainly negative, including the concern that it takes space when carrying it in the bag, that it leaks and that it does not have obvious advantages over a paper cup.

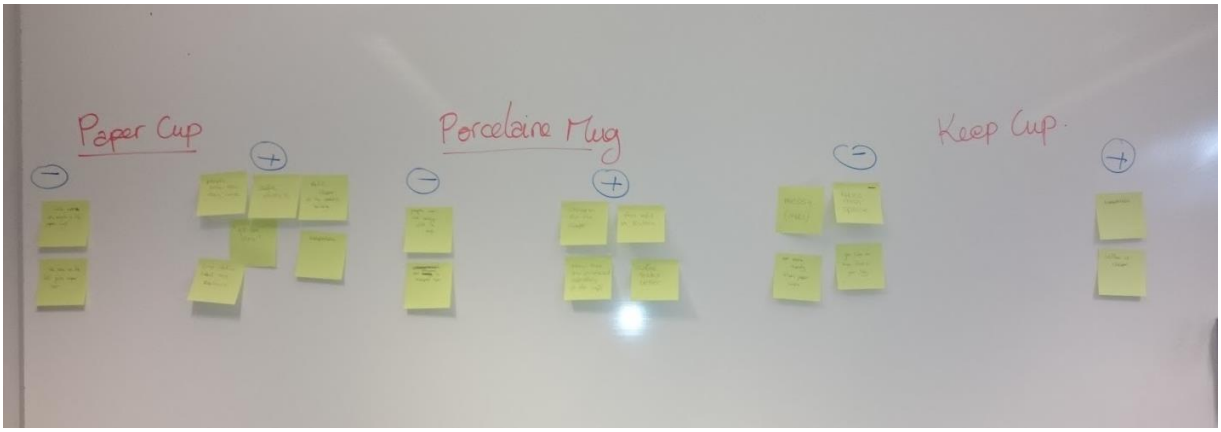

Figure 5.2 Analysis of advantages and disadvantages of different kinds of cups

The interviews and observations were a good way to get an overview of the current situation on which our study could be based. With the different conditions at the cafés in mind we then could continue investigating what kind of game would be suitable for this specific context.

5.3.2 **Focus group**

As a next step to begin the ideation, a brainstorming session with a group of students was held. The method we used for this kind of group interview was the focus group, which implies a relatively free discussion among the participants with the guidance of a moderator (Martin et al., 2012). The aim of this focus group was to get inspiration from the participants' different perspectives and to come up with first basic features to be included in the game prototype.

Initially, it was planned to conduct a workshop that would be divided into two parts, starting with a focus on how feedback and consumption could be displayed as well as on the general

interactions with the potential system. Later on the discussion should be directed towards the addition of game mechanics. Nevertheless, we decided to narrow down what we would discuss in this group interview to prevent the participants from being confused and overloaded. Since the game elements would be the essential part to be investigated, the focus group was centered on this issue whilst still keeping it more general in the beginning. With the outcome we then intended to be able to apply the ideas focusing on a game to the simpler version of visualization by taking away the game elements.

Setup

The participants of this focus group consisted of five Interaction Design students. The choice to restrain the group this way was made for practical reasons, since these participants are already used to this kind of approach. Also they are not afraid of being creative and to express even ambiguous or crazy ideas. Besides, they all consume coffee or tea outside their home at least once a day and therefore are confronted to the choice of cups that interested us. Several decisions were also made about the environment. The discussion occurred in a place that was familiar to the participants, namely their class room 'High'. But the environment usually being packed with working materials, was adapted to be more neutral in order to focus everyone's mind on the topic. The participants were sitting on couches around a table, which allowed them to imagine themselves at a café. Some typical elements were also used to give hints about the subject of the conversation, like a simulation of a counter where we set up coffee, cookies and cups. The latter were also used as mediating tool since we provided different kinds of them - paper cups, ceramic cups and a KeepCup, that people could utilize during the discussion to illustrate their arguments. Besides, we placed some printed out pictures of two of the campus cafés on the table to support the participants' imagination of such a place. Some other tools like clay, pens and papers were also provided, but not used. The focus group was conducted in a semi-structured manner, using predefined questions to keep the conversation active and within the frame of the topic. Nevertheless, the actual participation of the moderators was very low and the discussion among the participant therefore was quite free. The entire session lasted around 1 hour 15 minutes and was video and audio recorded.

Procedure

Starting with a 'fika' (coffee break with pastries in the Swedish culture) was a way to implicitly introduce the topic of the thesis and to make a 'test' with the paper cups and reusable cups. Since they were simply put on the counter next to the coffee and the cookies, the participants could freely choose their coffee container. Discussing and comparing the different choices and the motivation behind was then used as an icebreaker and as a start for the conversation. Basic questions about the participants' habits with coffee cups and their experience with cafés were then asked. This first step had the purpose to find out about the participants' attitudes concerning the context to be investigated. Later the focus of the conversation was shifted towards the game that should be introduced. The main aspects that were touched upon were the form the system should take, the interactions with it and the game mechanics that should be integrated. The two formers were rather intuitively discussed by the participants without us having to suggest it. But they only mentioned few actual game mechanics which is why some further questions were specifically pointing towards these aspects.

Originally the focus group was planned to be centered on bodystorming, asking the participants to actually play the different roles of café customers with the provided props. However, it turned out to be more of a verbal rather than physical discussion. Yet, the

participants seemed to delve into the subject without having to bodily experience the context. This is mainly due to the fact that the interactions with the imagined system were in the end quite minimalistic while the relationship to the café, the people around and the cups seemed more worth being developed further. Moreover, instead of applying the method Design Charrette, as initially planned and mentioned before, the brainstorming was held within the entire group. This seemed more appropriate than splitting the group in several smaller ones, considering the number of participants.

Analysis and Results

The analysis of the focus group required firstly the transcription of the audio record (see Appendix C). The recorded video was in the end not used, since the focus group, as said before, was not involving any role playing as we had originally imagined. With the transcription documents the statements relevant for the project were highlighted in order to find out what would be essential to the users. We then ended up with 60 of those statements some of them formulated as requirements, problems or ideas, which were written on post-it notes. This enabled us to categorize them using the KJ method (see figure 5.3), which gave a general overview of all the issues that would have to be considered when developing the concept. The seven categories we could distinguish were: *Rewards*, *Interactions with Others*, *Game Elements*, *Tools* (for Interaction and Feedback), *Self-Expression*, *Other Incentives* and *General Requirements*.

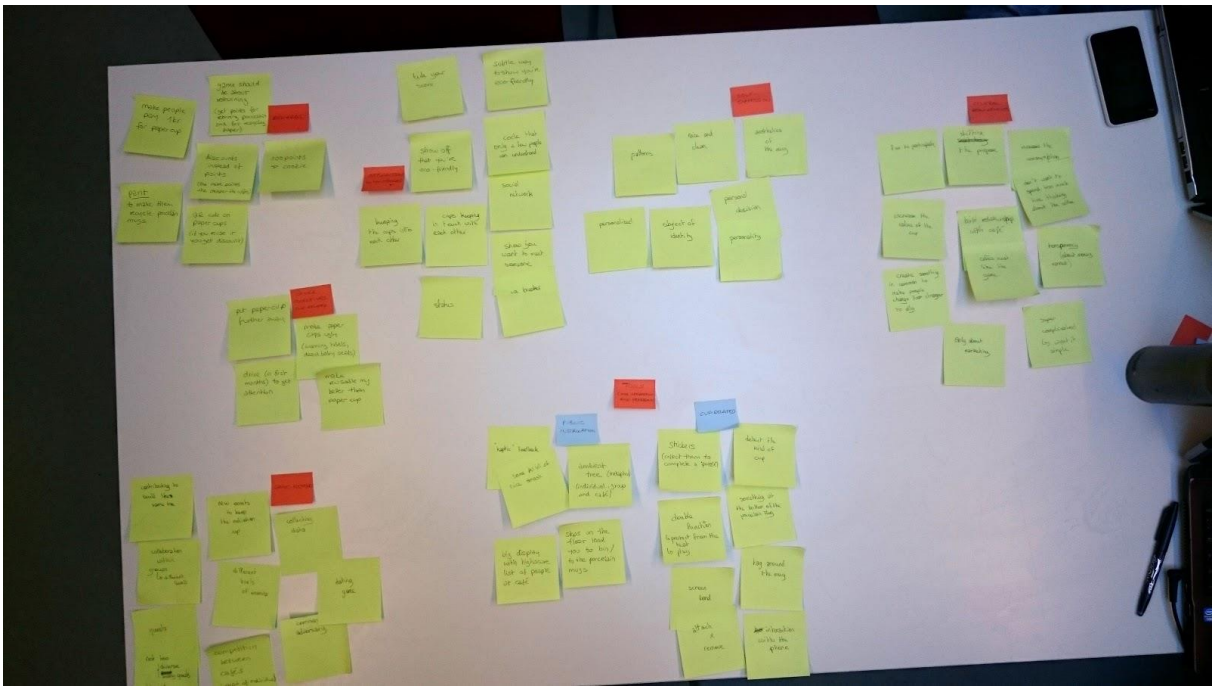

Figure 5.3 Categories of requirements from focus group

In the first part of the focus group issues with the different kinds of cups were addressed that would serve as a basis for the ideation about improving this situation. The stated advantages and disadvantages were filtered and added to the analysis that had been made with the short interviews in the step before. The participants mainly discussed around the use of personal reusable cups like the KeepCup which was perceived as a bad realization of a reusable cup. Followed by this, different incentives were defined that could encourage people to choose reusable cups over paper cups, which are included in the category Other Incentives. It appeared that quite simple changes such as making the reusable cups better than the paper

cup, or, the other way around, make the paper cups look uglier, was imagined to be very effective. Besides, especially relevant in places like Café Linsen, putting the paper cups further away and making the reusable ones more accessible could, according to the participants, already solve parts of the problems. Gamification as a way to address these issues was not mentioned in the beginning of the focus group, only after directing the participants with more specific questions.

As part of the category General Requirements, it appeared that the participants demanded the game to be fun but simple with the aim to create a relationship to the café and to the other people in the café to change them from strangers to allies. Yet, the issue was addressed, that it should not make people drink more coffee which would then only benefit the café's economy. Self-expression, as this category shows, was discussed and it seemed important that the cup itself, not only when used as tool in the game, should be aesthetically appealing since it is visible to the other customers and serves as an object of identity. It could even be used to show off the own contribution to the game and to saving the environment. In this context also the terms personalization and personality were highlighted and associated with the cups that could convey a certain message. Closely related to this category were the statements within the category Interactions with Others. Here ideas included not only to use the cups as a way to show the personal level of eco-friendliness but also as a means of interactions with others. The cups as icebreakers for conversations, a way to create a social network and to keep in touch with others, for instance, by bumping cups into each other, were only few ideas. On the other hand, privacy and the control of what to show to the public seemed important to some participants.

As the participants were also directly asked about certain game-elements, one category of the analysis included those such as competition with other cafés, a common adversary, collaboration within group, different quests as well as levels and new events that would keep up the motivation. Quite early in the discussion, one participant had the idea of a virtual tree that represents the consumption of the different cups and with it the level of environment friendliness on an individual base or for the whole café. Several other ideas were then based on this metaphor. With it the idea of a game building upon working together to make the tree grow.

The category Tools consisted of two groups of ideas that focused on more technical aspects and how a game could look like. It could be distinguished into 'Public Installation' and 'Cup-Related'. The former included again the idea of an ambient tree installation as well as having a big screen that would show the highscore lists of people within the café. Furthermore, some ideas evolved around the issue of recycling the cups, such as giving some kind of haptic feedback when throwing the cup in the correct bin or to lead people to the bin with illuminated footsteps on the floor. One major aspects that the participants returned to several times in the discussion was the cups itself as the tool for interaction, object of self-expression and the reason for certain problems. This is not only apparent in the category 'Cup-Related' with ideas such as collecting stickers for each time you use a reusable cup that can be attached onto the cup or tags and screen bands around it that would have the double function of protecting from the heat and being part of a game.

In short, the participants developed many different ideas without restraining themselves too much by thinking about the feasibility. This focus group was very inspiring to us and encouraged us to investigate further the stated issues as well as the various directions in which the ideas went.

Once the focus of our study and the possibilities offered by the topic were explored, we started building a concept iteratively and using various prototyping methods, involving the user at each iteration. At all times we considered both the visualization and the game mechanics as the essential aspects of the concept. The process that resulted in the final concept will be described in the following.

5.3.3 **Metaphor**

Our initial aim of the thesis was to investigate how the addition of game elements would influence people's behavior compared to a system that visualizes and gives feedback about consumption. Therefore, the concept had to be developed in two parts. The challenge was then to come up with a general theme and concept that would work for both versions: the visualization and the game. Therefore, the first iteration was all about the visualization part of the prototype to be build. This part of the process was centered on the metaphor that would be used to represent and visualize the consumption of paper and reusable cups. Based on the ideas discussed during the focus group, we chose two metaphors that we imagined people could relate to and that we used in several short interviews (figure 5.4). One was an anthropomorphic cup hat could show feelings and perform actions and its body being made of different proportions of paper and ceramic. This kind of representation did not directly emerge from the focus group but rather was inspired by different cases, such as the Energy Chickens by Orland et al. (2014). The other one, based on the focus group, was a tree that would grow and look healthy or show signs of sickness depending on the consumption. The metaphors were chosen to be very opposite, since their purpose was to trigger discussion and to investigate general preferences among the students that were asked.

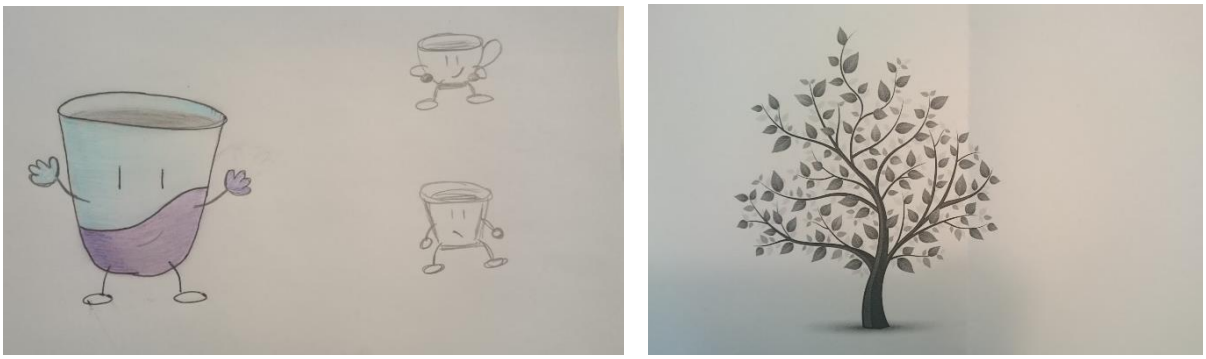

Figure 5.4 Two kinds of metaphors presented to interviewees

In total 16 students at the above mentioned cafés were asked to pick one of the representations and to argue for this choice. The interviewees were both female and male students who stated to be frequent customers of the respective café. The interviews were aimed to get an impression of people's preferences and the reasons for it, without going too much into detail with the questions. This made it possible to ask several people in a short time and at the same time to get a good sample size which could be seen as representative for the target group of students in this context.

None of the two metaphors clearly stood out but the qualitative feedback gave some further insight in what characteristics people required. The interviewees preferring the cup considered it as more appealing and entertaining as well as showing more clearly the link to the topic. They would also feel more connected to a character expressing feelings. The arguments in favor of the growing tree insisted on its serious look and the clear connection to ecology, which would make people more concerned about the outcome. Summing it up, the metaphor should be visually appealing and rather serious than silly. The design should be able to make

people feel connected to it without being too childish. Furthermore, it appeared to be important to make it not too generic since it should make obvious both the aspect of the environment and the cup as well as their relation.

5.3.4 Requirements elicitations

At this point of the study, based on all previous works, several requirements were elicited which our concept should be built upon:

Visual aspect

- A central metaphor visualizing the consumption, which people can refer to and see evolving (Nakajima and Lehdonvirta (2013), focus group)
- The metaphor should highlight the connection between the environment and the cup (interviews)
- The metaphor should be entertaining enough to make people feel a connection to it but not too childish so users take it seriously. (interviews)

Game mechanics

- Collaboration and Competition as two elements that should be balanced, supported by challenges to entertain and motivate the users (literature sections Motivation, Gamification, focus group)
- Building something, to make people feel as participants of a creation process (focus group)
- Choice and Personalization, which would reinforce the previous requirement by enabling users to make choices about their contribution and feel more attached to it. (Oulasvirta and Blom (2008), focus group)
- Positive and Negative reinforcement, so that the personal influence on the metaphor depends on the kind of cup used > the use of reusable cups is positively reinforced, whereas the use of paper cups is negatively reinforced (Nakajima and Lehdonvirta (2013), Consolvo et al. (2009))
- Balancing Individual and Collective Rewards, adding External Rewards when appropriate (Extrinsic/ intrinsic motivation, Malone and Lepper, 1987)
- One Main Goal (McGonigal (2011), Keller (1979), Bizzocchi and Paras (2005))
- Levels and Mini-Games to keep up the motivation over a longer period (literature section Motivation, Björk and Holopainen (2006), focus group)
- Balance of Complexity and Time required to play (Müller et al. (2010), focus group)
- Possibility to Show Off the own contribution (Malone and Lepper (1987), focus group)

Moreover, the design was intended to be realized around the goal to persuade the player to change behavior, meaning that the game belongs in the category *Macrosuasion* defined by Fogg (2002) (see section 3.5). Besides, the intended users of the game fit in all categories of the Transtheoretical Model by Prochaska and DiClemente (Glanz and Rimer, 2005), even though a special attention is set on people in the stages precontemplation, contemplation and preparation. Therefore means to inform people as well as to motivate them should be used. The other two stages simply need reinforcement to keep their ‘good’ behavior. Lastly, making use of the Theory of Planned Behavior (Glanz and Rimer, 2005), the general opinion regarding the attitude towards the behavior and the subjective norm are quite positive. Reusable cup are indeed considered as more eco-friendly on personal and societal levels. The problematic resides here in the perceived behavioral control. It is natural to wonder if it is

worth taking a reusable cup when no one else does and to think that this isolated action might not have a big impact. Using a paper cup can also be dictated by the need to take away the coffee. The further study therefore had to take these parameters into account to find out how to manipulate them.

5.4 Phase 3 – Concept Development

The requirements elicited at the end of Phase 2 were used as guidelines and reminders for the development of the concept in Phase 3.

5.4.1 More ideation

The decision was made to continue working with a combination of the two previously described metaphors, but the challenge remained to define how it should be done and how it should evolve and be influenced by people's actions. To answer these questions, another round of brainstorming was held, this time only among the two of us. We already had in mind that a screen would be the best support for displaying the metaphor, since a digital implementation is more adaptable, and this influenced the ideation. Several ideas were developed and criticized based on the degree of fulfillment of the requirements and their feasibility. Among them, some are worth mentioning to understand the process. We first imagined a tree growing out of a cup, which would consequently serve as a plant pot; taking a reusable cup or a paper would make the tree grow or present signs of sickness and the plant pot's color would slowly evolve to warmer or colder tints. It seemed to be a good way to combine the two aspects, but the evolution of this metaphor does not require any personal decision from the user. The involvement was thought to be more important and the user should be able to specify, for example, how he would like the tree to grow. This was, however, not very applicable in the present combination so we modified it slightly, still keeping the idea of the cup as a central piece. The tree was replaced with plants and flowers that could be positioned wherever on the cup. Yet, the concept of simply covering the pot seemed pointless, with no real purpose other than being aesthetic. Therefore the idea of a virtual broken cup to be fixed with the help of plants was introduced. Here again, the choice made by the users seemed restricted and the personalization would be either too simple (selecting a plant), and hence boring, or very difficult to understand (select a direction for a plant to grow). Many similar steps and discussions pointing out the pros and cons of each solution were needed before coming up with the final metaphor. This method of iteratively building on the strengths and weaknesses of the previous ideas helped to simplify the task, since we could concentrate on the latter while improving the concept. One source of inspiration, which turned out to be crucial for the final concept, was represented by an interactive installation at the Tekniska Museet in Stockholm. As part of an exhibition about the design of the Coca-Cola bottle, the visitors could design their own bottles which would then be shown on a big screen visible for everyone. This kind of installation which allowed to pick from several design patterns and position them on the shape of the bottle, seemed simple but fun and therefore appropriate for a momentary interaction in a public place.

5.4.2 First version of the concept

Finally, the idea we based the later stages on resulted in the outline of a cup that is placed on a background of a grassland. Using a reusable cup would enable the user to place a building block or tile inside this virtual cup building upon other already existing blocks. The user would choose to place this tile at one of the offered positions and could then also personalize it by changing its appearance. Taking a paper cup would, on the other hand, somehow damage

the construction of building blocks. Several paper cups would then make tiles disappear, and thus lower the height of what fills the virtual cup. This basic concept was then developed further with the addition of other game mechanics that should increase the challenge and with it the user's intrinsic motivation (Fullerton, 2014). Several levels, for instance, were defined for when the building blocks fill the cup up to a certain height. Reaching a next level would increase the difficulty, meaning that the damages caused by the use of paper cups would become more serious. Besides, the level would also mean the addition of new features such as a random reward spot. When placing a tile on that random spot, the user would earn an external reward such as a free coffee which stimulates the extrinsic motivation. Lastly, each time a level is completed, all customers of the café would be rewarded by being able to access a mini-game, as a short game within the game. This was imagined to be a quiz or some kind of race but was not further elaborated at this stage. Originally, the idea was to let everyone buying a coffee add a tile, but give users with a reusable cup more options and even let them play more. This would mean, for instance, the customization and the mini-games would only be playable with a reusable cup. Yet, we wondered if the impact on people using a paper cup would be strong enough and therefore decided to change the negative and positive reinforcement so it would be either 'allowed to play' or 'not allowed to play'. With this we aimed to highlight the difference between 'good' and 'bad' behavior caused by the use of either a paper cup or a reusable cup. The fact that customers with a paper cup have a negative effect of the virtual cup by damaging a tile, reinforced this and allowed them to clearly see an effect of their action. We also imagined that some peer pressure would come here into play making people feel a bit 'ashamed' about their choice.

The whole concept can, however, not work if there is no cohesion among the participants, who are likely to be (familiar) strangers to each other (Milgram, 1977). Therefore, as it emerged from the focus group, a competitor café identified as the common adversary was introduced to enable the creation of group dynamic within the café. This second café follows the same goal to fill its own virtual cup and its current status is visible for the competitor at any time. The overall goal of the game then ensues from this: to be the first café to entirely fill up the virtual cup. The guests of the winner café was thought to win external rewards, for instance one day of free coffee or some special offer for pastries. This main extrinsic motivational factor was yet not looked into further. Real collaboration was also added to enhance this phenomenon among friends. They could decide to combine their individual tiles to create a bigger and more powerful one that would multiply the rewards in case they earned any. Furthermore, real-time feedback was aimed to be provided throughout the game, for instance with animation that would highlight certain events and actions of the user. In default the screen would display the current status of the virtual cup. All these mechanics place the game in the categories challenge, fellowship and expression in the *8 kinds of fun* defined by Hunicke et al. (2004).

In this concept the theories of behavior change are taken into account. The simple presence of the system in the café will advertise the possibility to take reusable cups instead of paper cups, which should reach the people in the precontemplation phase. The interest of participating is reinforced by the external rewards, previously mentioned. This latter also targets people in the contemplation and participation steps. The peer pressure and the building aspect should also contribute to bring them to the following stage. The question about the impact of an isolated action raised previously has no more reason to be since the game enhances group actions. Finally the rules of the game make the actions repetitive, so along with the fun aspect, it should bring players to build some habits to reach the maintenance stage in the end.

With the basic concept in mind, bodystorming helped to explore potential interactions, meaning how the user's inputs could be registered and the according feedback would be expressed. It enabled us to put ourselves in the position of a person purchasing a coffee at a café. Based on the previous observations, a simulation of a café was created and scenarios were played within the group that included all the steps it would take to get a coffee. At that stage, the different kinds of cups were imagined to be detected thanks to RFID tags or QR-codes. This was supposed to be done at two key spots, at the coffee machine and at the screen displaying the virtual cup. The system would then know what kind of cup is used, save its ID and with this allow its owner to play. This would prevent customers from playing more than once. Once the play mode is triggered on the screen, users would then be able to easily manipulate the different parameters of their tile (position, color and icon) with the help of push-buttons (arrows, OK). Moreover, since the cup itself had been a center point of the focus group, this third element as a tool to play the game kept being part of our discussions. The paper and reusable cups were of course included, but the topic focused also on a potential personal cup that customers would bring every day and which would offer new possibilities. This personal cup would serve not only as an identification like all other kinds of cups, but also to receive information from the system about the personal contribution, to be able to display it. The bodystorming made us think about when and where our system should come into play and how the interactions with the different parts could work. To support this structured thinking, whiteboards were used to draw schematics of the different steps and how they would be related (figure 5.5).

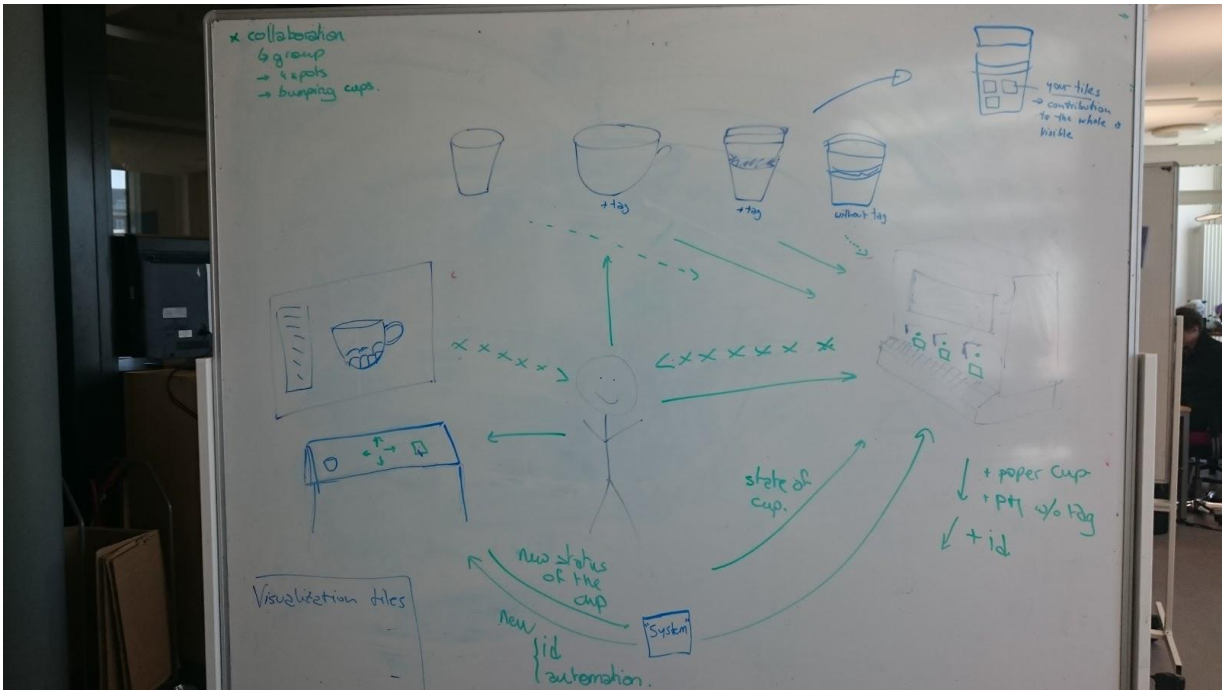

Figure 5.5 Schematic showing the interactions with and relations between the elements

In the end, the concept matches the category *medium* from Fogg's framework (2002). It aims indeed to make people try out the different behaviors to decide what would be best.

5.4.3 **Expert evaluation**

When the concept was finally formulated, we decided to evaluate it informally by having discussions with our supervisors and employees from Interactive Institute Swedish ICT who were also involved in the TRIBE project. In general, the feedback was positive and some points were questioned. It made us defend our concept and get focused on the problematic

aspects of it. More important for the next steps, it gave us constructive critic from experts who have more experience in this kind of projects also considering the technical aspects about the actual implementation. Mainly the automated detection of the different kinds of cups was argued to be too complex to set up in our concept but they provided us with alternatives to simulate this. It appeared that it would be not feasible to equip the 500 coffee cups per day - according to the numbers collected during Phase 2 - with individual tags. A more reasonable solution therefore would be to ask people to enter their choice in a system. This could easily be done by adding a tablet at the place where the cups are first detected, which is the coffee machine. Buttons on the tablet could be provided so customers simply would have to press the one corresponding to the cup they are holding. This solution involves a lot of trust and the results might be less accurate. Yet, adapting the user field study to these new conditions seemed to make it possible to compensate for these drawbacks. It would also enable a better real-time feedback, since this small screen instead of the main interface could be used to display information directly related to the user's input, making it more private and more directed towards the target. On the other hand, the main screen should trigger the personalization mode only if the 'reusable cup' button was recently pressed and when the cup is placed on some dedicated spot, which should contain a simple sensor (e.g. weight sensor).

The expert discussion also made obvious that it would be important to test the concept again with users, focusing on the interactions with the different elements and the general gameplay. Therefore, we decided to consider the limitations induced by the technology and to make a prototype based on the basic game concept which could be tested before implementing it for real.

5.5 Phase 4 - Prototyping

During the previously mentioned conversations with experts from Interactive Institute Swedish ICT, some other aspects, mainly game mechanics, were discussed. Our concept is very ambitious and the prototype would require several weeks to be fully implemented. Therefore the decision was made to focus on the main parts of the concept, which are the personalization or customization of the tiles and the competition. Everything else was thought to be studied through other means in interviews after the study. Before implementing an interactive and polished prototype, paper prototypes were created to be tested in a user test. The following sections will describe the low-fidelity prototype and the user test and will later focus on the implementation of the high-fidelity prototype.

5.5.1 **Low-fidelity prototype**

The purpose of this prototype was to evaluate the design of the two interfaces (tablet and main screen) as well as the fluidity of the whole process of taking a coffee and playing the game. For each screen, the interface containing the main elements - name of the game (which was 'The Mug' at that time), the virtual cup and the background - was sketched with colors on paper. Additionally, elements that would be temporarily displayed, like pop-up text boxes or the play mode, were drawn on small pieces of paper so they could easily be added to or removed from the interface during the user tests (figure 5.6).

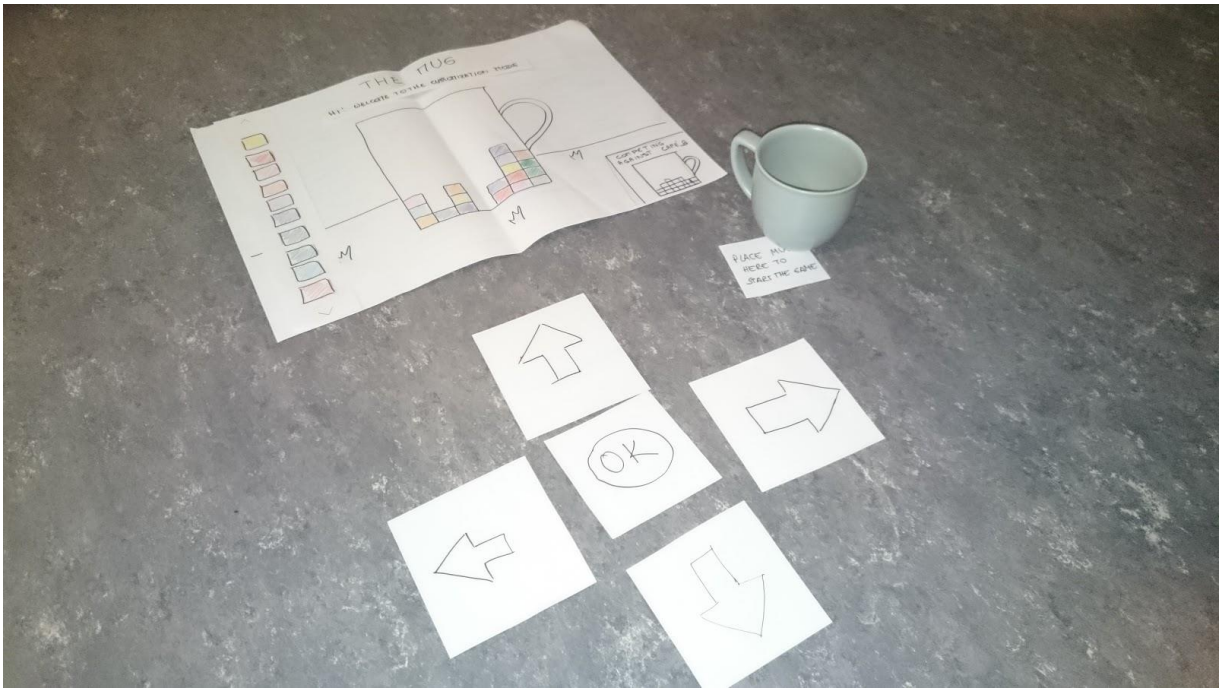

Figure 5.6 Paper prototypes

On the tablet, two buttons were added underneath the virtual cup, one for each category of cup. Depending on the button that is pressed, different reactions would be displayed. In case of a paper cup, a tile would be covered by lighter colored version of it showing that it is a bit damaged. The following texts would also be displayed “Oh no, you used a paper cup and weakened the Mug”. On the other hand, pressing ‘reusable cup’ would make the following words appear: “Cool, you used a reusable mug and won a tile. Go to the main screen to play it”.

The main screen had two different modes: default and play mode. The former displayed the background described earlier along with a smaller version of the virtual cup in the bottom right corner, representing the status of the competitor café. In the play mode a blank tile with

dotted outline would be placed above of another tile of the construction, showing the current position of the new tile. When moving it left or right, it would then be positioned on the next free spot. A vertical selection panel displayed on the left side of the screen showed the available colors, and the selected one would be highlighted with an arrow supported by the changing of new tile's color. Instructions in text boxes would be displayed telling the user how to pick a color. As explained earlier, the interaction with the main screen would happen with physical buttons. When creating the paper prototype the idea was to enable changing all parameters of the tile (position, color independently and with no specific order. Therefore we imagined a pad with four arrows, left, right, to move the tile horizontally and up, down to change the color. In addition, an OK button could be pressed once the selection is done. Lastly, the component simulating the sensor to detect the cup was placed next to those buttons.

5.5.2 **User tests**

As a next step, user tests were conducted using the low-fidelity prototype in order to evaluate and refine the concept of the game (see Figure 5.7). The tests were done individually with eight participants, all having a background in Interaction Design which meant they would have an eye for usability issues and a good understanding of what kind of critic is desired. They took around 15 minutes each and were conducted within the participant's usual working environment. Additionally, different props were used to simulate the situation of being customers at a café which is where the concept would be applied.

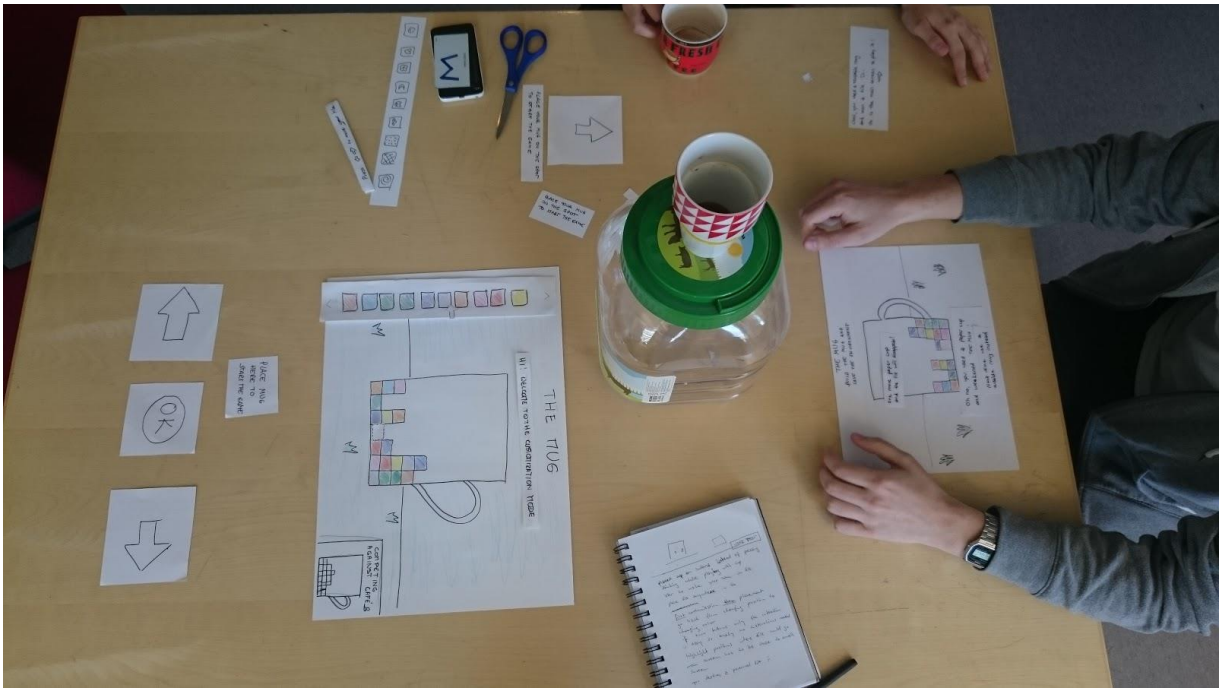

Figure 5.7 Setup of the user tests

The participants were asked to play two scenarios while using the paper prototype that represented the elaborated concept in order to discover problems that could occur when introducing the prototype to the actual context. The first scenario started with taking a coffee in a paper cup and observing what would happen on the small screen next to the coffee machine. Since this screen only told them that they used a paper cup and therefore were not allowed to play the game, this was also the last step for this scenario. In the second scenario the participant took a coffee but in a reusable cup and then got the according feedback on the small screen. As this feedback told them to go to the main screen to play, they moved over to

this part of the prototype and went through all steps of the game. Making use of the Wizard of Oz method the paper mockups of the screen were manually changed by us depending on the participant's actions. In addition, the participants were asked to think aloud and comment their interactions with the system. After each scenario, questions were asked that included whether they understood what was happening on the screens and why as well as if it was clear what they had to do. Further questions were aimed to get more detailed feedback about the layout of the screens and the kind of information that those displayed.

In general, the participants had no difficulties understanding what they were supposed to do and what the game was about. Yet, there were several comments about direct feedback and what information the screens should give the user. Most of the participants demanded that the screens should give more immediate feedback about an action, for instance when pressing buttons before activating the game with placing the cup on the sensor. Information given on the small screen should also be more clear and precise, to not make people have to read much. Less words and instead pictures or exaggerated animations was one suggested solution for this. The language that was used for the feedback was also said to be too judgmental, which could mean that taking a paper cup would make people feel guilty so they would not want to press the button again next time.

Information should also direct the user to the main screen and indicate where this screen is positioned. Concerning the screen, the question was raised why it would have to be two screens. Some participant wished to play directly when taking the coffee instead of walking over to another screen which would require too much time and effort. Either way, it was demanded that the two screens should be placed close to each other to avoid inconvenience. The interaction with the game on the main screen was another issue addressed in the user test. Some participants suggested to only have two arrow buttons, left and right, to make interactions even simpler and more intuitive. Therefore, the customization should be done in a certain order, even though opinions diverged about the steps. Whilst some preferred to start with changing the appearance of the tile, others wanted to place the tile first before changing its color. Most participants also required more personalization such as uploading own pictures, writing their names or initials or even drawing own sketches which would allow them to distinguish their tile from the others and thus make the game more meaningful and fun to them. On the other hand, destroying a tile when using paper cups was an action that was regarded with concerns. It was seen as a punishment for the ones who created the tiles and a situation where nothing could be done against those who used the paper cups.

Lastly, some suggestions for changing positions of certain elements on the screen were made. This included placing the element showing the colors and images to pick from horizontally underneath the virtual cup so it would match with the interactions with the left and right arrow buttons. Further, the position of the competitor café's virtual cup was discussed with different opinions. And as an easy way to compare the status of the two cafés, the idea of an element showing the percentage of completion was brought up.

5.5.3 **Final Concept**

The insights of these user tests were applied to our concept and we then formulated the latest version that would be the base for implementing the prototype. Moreover, we saw the need to have a name, to make it easier to talk about it within the group but also to convey the idea to others. After spontaneously discussing several names and possibilities to have them as a logo, the decision was made to call it Cup Builder which already makes it obvious what the basic concept is about. Besides, it would allow the distinction between the two versions of the

prototype, one being Cup Builder - the Visualization and the other being Cup Builder - the Game.

Summing up the concept of the Game, it includes four major aspects that support user's engagement and motivation: **personalization, real time feedback, collaboration** and **competition**. As it emerged from the user tests, the aspect of personalization seemed to be important which is why this was developed further. Using a reusable cup and therefore being allowed to play now implies that the user can personalize his tile by choosing its position, color and adding further visual extras. These options include choosing from a selection of icons, taking a picture or uploading one from a smartphone, and making an own sketch. The aspect of real time feedback is covered with animations and changes directly visible on the screens after a certain action showing the user's personal impact on the overall consumption of cups in the café. Among all customers of the café, collaboration is required in order to reach the major goal of the game, which is filling the virtual cup. Additionally, the element of competition against another café with the same goal poses the challenge to be the first to fill the cup. In order to keep up the motivation over a longer time, levels that mark when the building blocks fill the virtual cup to a certain height increase the challenge within the game. The impact of using a paper cup gets stronger but the addition of a random reward spot gives the user the chance to win a free coffee when he places his tile on that spot. Furthermore the mini-games, like a quiz or race, that are added for each level, even though being not developed any further, enable everyone with a reusable cup to play even more outside the main game. Further features to enhance the experience when participating in the game is the creation of a special tile with increased options of personalization when several people with reusable cups combine their tile. Lastly, the reusable cup is imagined to serve as display for the tiles that the user added to the virtual cup, showing his contribution to others.

Cup Builder - the Visualization stays a simplified version of the previously described concept in which the tiles are added randomly, its color and position being chosen by the system instead of the user.

5.5.4 Implementation of the high-fidelity prototype

The high-fidelity prototype is an automated version of the previous low-fidelity version, taking the remarks from the user test into account. Changes are that only three buttons (left and right arrows, OK button) were kept to interact with the main screen, the customization is further developed with the possibility to add an icon and is realized step by step. As for the tablet to be placed next to the coffee machine this would now also serve as detection of the kind of cup, by enabling the customers to press the according button. Besides, the interface on both screens was designed to be less cluttered with unnecessary text. Different technical choices, mainly regarding the hardware and software, were made at this stage and will be described in the following.

Software

Before the expert discussion with people from Interactive Institute Swedish ICT, we had planned on using tools dedicated among others to rapid automated prototypes to deal with the visual part. OpenFrameworks, an open source C++ toolkit for creative coding (openFrameworks, 2015), or Processing, a Java based development tool for visual arts (Processing, 2015), with their numerous libraries seemed to be good candidates. They both are not very complex to utilize and enable building polished-looking programs with few resources. However, the concept implies a certain kind of communication between the different devices as well as a way to store data. A database is, in our case, the best solution to

this last problem. Hence, the limited time made us switch to a technology that combines all these parameters in one, reducing the amount of work. The final prototype is based on webpages located on a distant server, where a database is already included, making an implementation of a local computer not necessary. Devices 'communicate' through the database using the Internet connection. The transmission of information is actually made by changing the data from one device; this is then detected during the check regularly carried out from the other device, which triggers the update of the display. Furthermore, the frontend is based on HTML5, CSS3 and above all JavaScript. This language considers the dynamic aspects of a website and enables interactions with the user ("JavaScript", 2015). The backend is operated by PHP and SQL, which are the most used languages when communicating with a database.

Hardware

The simplicity and adaptability of the software solution allow an important freedom for the hardware. The tablet and the distant server, also part of the hardware solution, were previously described. Regarding the main screen, a controller, a keyboard-like tool for user input and a sensor (respectively for the buttons and for detecting the cup) were needed. For the former, we opted for a Raspberry Pi 2, a credit card-sized board which mainly runs the operating system Raspbian, an adapted version of Linux ("Raspberry Pi", 2015). It was implemented with the aim to provide children with a "tiny and affordable computer" ("The Making of Pi", n.d. para. 1) to make them interested in programming. The amount and the variety of ideas based on this board show its versatility and make it interesting for our project. The latter two needs were fulfilled by using a Makey Makey. This tool enables transforming any conducting object (including body) into a command of a key pressed on the keyboard, when mapped to the Makey Makey board thanks to alligator clips. It is based on basic electricity principles: in the normal status, the circuit is open, but once it is closed, the connection triggers the command ("How does it work?", n.d.). In our case, push buttons with 3D arrows and OK selector were used. The sensor to detect a cup at the main screen was based on the same idea. It was made out of two plates covered with aluminum, each of them connected to the Makey Makey board and kept apart thanks to foam pieces on the sides. The weight of the cup placed on them is enough to compress the foam and make the plates touch each other, which creates the connection.

The implementation based on the just mentioned technologies was then divided into two parts, one of us taking care of the frontend, the other working with the backend. This was done based on our previous knowledge even though it still meant for both to learn new things. Learning by doing and testing different variations of code helped us to get a solid working prototype. Throughout the entire phase decisions were made considering the balance of limited time and the will to build something functioning and visually appealing to present to our users.

Whilst the main implementation as a base for both versions of the prototype happened during three weeks before the user study, adaptations and bug fixing were done during the study. Besides, the actual game elements were implemented during week 2 of the study while the first version of the prototype was already installed at the café. Nevertheless, it was attempted to not change major things during the study itself to make sure to not influence the results with this.

Due to time constraints a proper evaluation of the prototype involving users could not be done before the actual study. That is why the first day of each week of the study served as a pilot day which helped to discover issues and to adapt the prototype to the new environment.

These weeks of implementation also served as preparation for the study, getting the confirmation of the staff at the café that it was possible to conduct the study there, as well as finding participants.

5.5.5 Visual appearance of the high-fidelity prototype

All design decisions concerning the visual appearance of the prototype were made by the two of us during the process of prototyping. They are based on balancing time and effort needed to create the graphics and the desired level of detail for the final version of the prototype. For these decisions no potential users were directly involved since the scope of the thesis did not allow a focus on this part and because the aim of the study was not to have a finished visual design of the game.

General style

The style of the graphical elements is inspired by pixel graphics that can be found, for instance, in old Nintendo games such as Super Mario. This resemblance is supposed to make the game recognizable as such and give the appearance a playful character. Attracting people and making them curious is another aim that is supposed to be fulfilled with that style. Moreover, the simple graphics are fairly fast to create, which is indeed an advantage when implementing a prototype. They make the general appearance coherent, yet, leave space for further development. This allows the user himself to decide whether he sees it as an unfinished prototype or a simplistic game. The graphical elements being based on the square shape of pixels also fits with the idea of the tiles that represent reusable cups and are essential elements of the game.

Figure 5.8 Main screen of Visualization

The layout on both screens is dominated by the virtual cup, which is the main element of visualizing the consumption of coffee cups (Figure 5.8). This metaphor was designed based on the feedback from the focus group and short interviews. All other elements are arranged around this center. The virtual cup is designed so it can contain a maximum of 63 tiles in 7

columns and 9 rows. This number was calculated based on the reference study in which the number of paper cups and reusable cups used per day was measured. The cup itself is more prominent when empty and the white space suggests the users that there is still much work to do. The more it is filled the more the cup automatically somehow fades into the background. This gives the tiles more dominance but keeps them in a frame to make it obvious when the goal of filling the cup is reached.

The colors that the tiles can have were chosen as the primary colors blue, red, yellow, green and magenta. This amount seemed appropriate to make them stand out without making the screen too colorful. And it would limit the user's choice in the game version to make his decision easier and less time consuming. The choice of colors also underlines the style of the pixel graphics and generates an eye-catching impression when the virtual cup is filled with the potential to draw people's attention. Furthermore, those colors are present in the logo which was designed to fit into the overall picture.

The logo is another important element in the prototype that appears not only on every screen but also on the info sheets and was used on the flyers to promote the prototype. The font was chosen to support the game character which is accompanied by the tiles as the main element of Cup Builder. With this, the logo gives a hint what Cup Builder is about and supposedly makes people curious to find out more. On the screens it is aligned like a headline on top of the virtual cup. Due to less space, it had to be moved to the upper left corner in the game version on the main screen.

As a representation of the environment the background behind the cup displays grassland with different kinds of plants that appear dependent on the amount of reusable cups that have been used. Flowers, bushes and finally trees represent these three levels of consumptions. At a late stage of the game, when the virtual cup is almost filled, the background then contains many elements which together makes it very obvious to the customers of the café that something has changed since the beginning. The sky that covers parts of the screen is designed with fewer elements to prevent the screen from being too cluttered. Elements such as the clouds and plants were designed with the purpose to make animations possible, which was yet disregarded when implementing it.

Interactions and User Interface components

The two buttons on the tablet are kept rather unobtrusive in color, yet big enough in size to be visible and touchable and they are containing text in the same font as the logo to keep the consistency (figure 5.9). Besides, they are placed underneath the cup at the bottom of the screen. This enables the user to press the button and see the direct feedback without him obscuring the screen with his hand. The position of these button, in fact, was originally at the top of the screen and was soon changed when observations revealed the above mentioned issue.

The direct real time feedback on the tablet is visualized with small animations. In the first version of Cup Builder, when a tile is added by pressing 'reusable cup', it appears at the top of the screen and falls down to its final position. The damaging of the tile after pressing 'paper cup' is highlighted by a yellow flash symbol that fades in and out in a short time (figure 5.9). The actual effect on the tile that is being damaged, was changed when implementing the prototype in order to make it more visible that the tile would gradually disappear from the screen. It was decided that it would lose one part of its height for every time a paper cup is used, until it would completely disappear from the screen and the tiles on

top of it move down accordingly. Since the main screen is not interactive in this version, no animations are visible there.

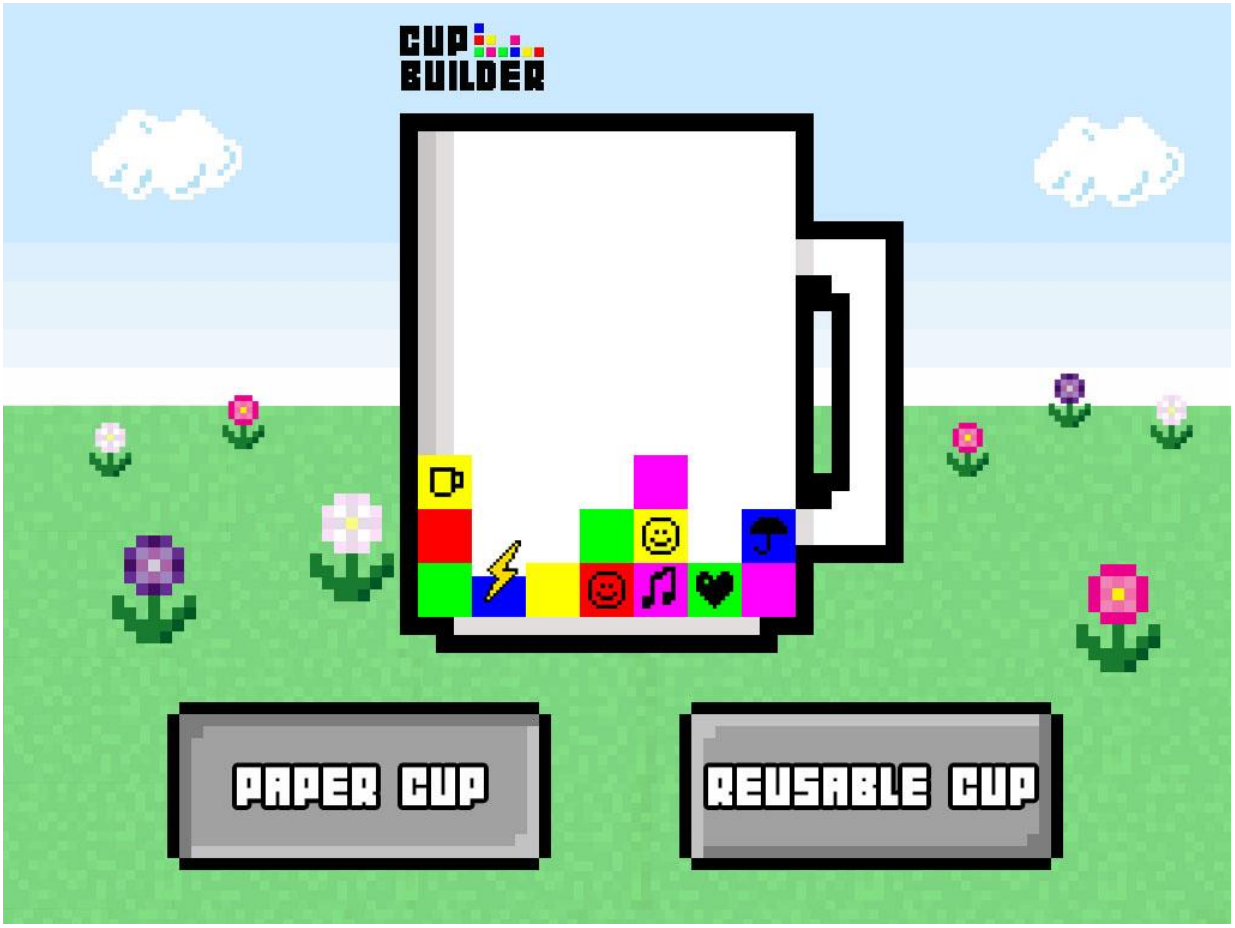

Figure 5.9 Tablet screen - damage of tile after button press on 'paper cup'

In Cup Builder - the Game the main screen becomes the place where to play the game which is why certain new graphical elements are added. The default screen is the same as in the first version, yet, when placing the cup on the sensor, the play mode is activated and what is on the screen is changed. The space underneath the virtual cup, which has been moved upwards for the game version of the prototype is now used for the UI components and instructions. The first step of the customization mode is the placing of the tile for which the user gets instructions in a textbox saying 'Move your tile with < > and press OK' (figure 5.10). Next, the color of the tile is to be chosen which is done by selecting one of the five options from the colorpicker panel (figure 5.11 a). This component consists of a box containing five squares in the colors red, yellow, magenta, green, blue. Pressing the physical button to the right highlights the square to the right with a black frame. This highlight is moved according to the button presses and helps the user see which color is selected. This is supported by the fact that the personal tile that he earlier positioned in the virtual cup also changes its color. Pressing the OK button changes the colorpicker panel to an iconpicker panel (figure 5.11 b). The UI component now shows five icons that can be selected the same way as for the colors. The icons illustrate a heart, a smiley, a note, an umbrella and cup. These have been chosen to be easily recognizable even in a small size and when created with only few pixels and provide the user with relatively different options. Since the actual color of the tile is already very dominant, these icons are kept in black which makes them more stand out from the background. Besides, their appearance underlines the pixelated and unfinished character of the rest of the graphics and leaves much space to be developed further. Since the decision was

made to leave the user the choice whether or not he wants to display an icon on his tile, the component consists of one more square. Whereas all possible icons are placed on a white square, the one furthest to the left displays no icon but is crossed out which represents selecting no icon.

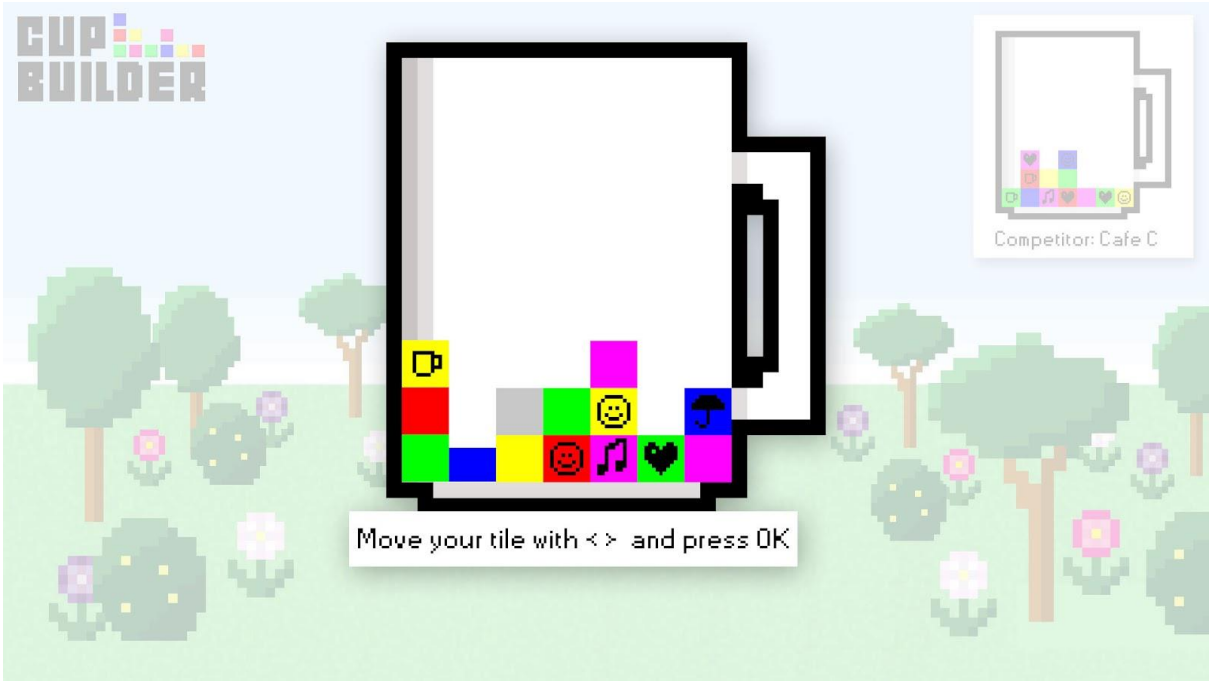

Figure 5.10 Main screen of the Game showing first step of customization

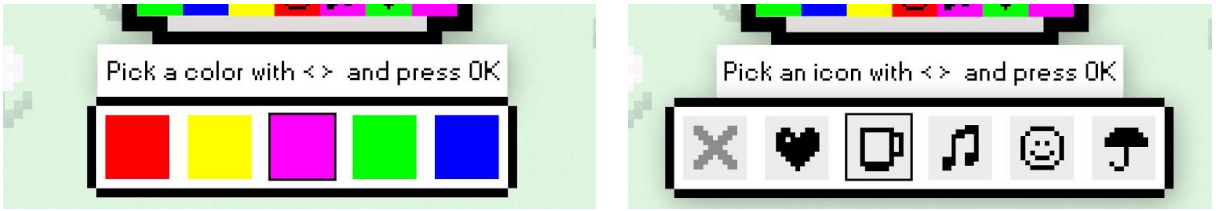

Figure 5.11 Main screen showing (a) colorpicker panel and (b) iconpicker panel

Placing the colorpicker and iconpicker panel horizontally underneath the virtual cup, instead of vertically on the left side, resulted from the user tests with the paper prototypes. This alignment allows a more intuitive and simple interaction with the help of the two physical buttons, as mentioned above. The usability of the prototype is even more addressed with the addition of instructions and feedback that should help the user perform actions. They are visible on the paper next to the main screen as well as in textboxes on the screen that tell the user what happened or what he is supposed to do, such as the hint 'Pick a color with < > and press OK' when he was to choose a color for the tile.

The important element of the competitor's café is also added in the Game version. The upper right corner of the main screen shows a small version of a virtual cup which represents the cup consumption of another café (figure 5.10), chosen to be Café C at the campus Lindholmen. This part of the prototype was simulated during the study but was imagined to be automatically updated the same way as the own virtual cup in the center of the screen.

Lastly, the physical buttons play an important role within Cup Builder - the Game. They were designed to be tangible and exaggerated to make it obvious that this version of the prototype

was about a game (figure 5.12). This also gives them a playful character which apparently was appreciated by the users. The visualizations on the buttons depict the outline of an arrow to the left and to the right as well as the lettering ‘OK’ which is also framed. Further, this design was chosen to make the interactions intuitive with buttons whose actions are easy to understand.

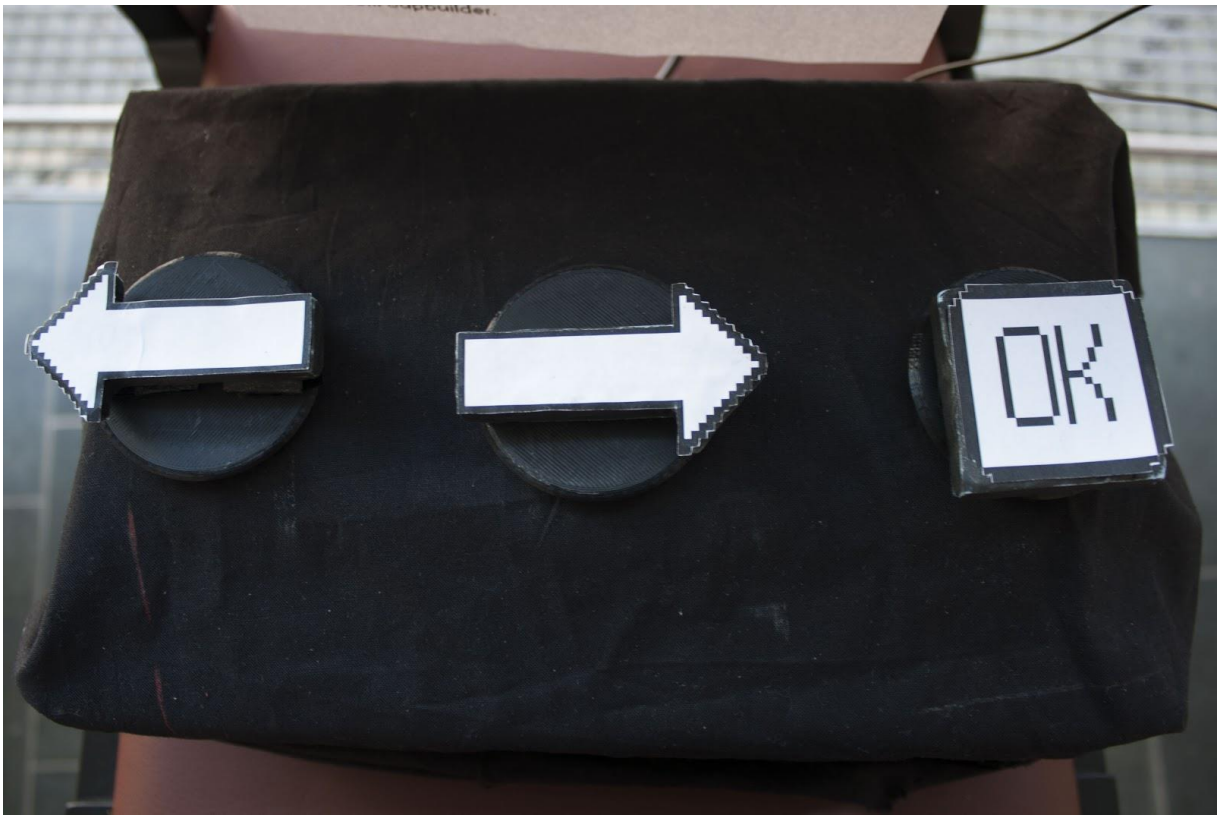

Figure 5.12 Physical buttons used to interact with the main screen in the Game

5.5.6 **Interactions and process**

The interactions with the different screens in the final prototype are essentially based on the ones designed for the first iteration and on the findings from the user tests. The following schematics (figure 5.13 to 5.15) show the different options the user has when interacting with Cup Builder and what they affect in the game and the visualization, mainly in terms of what is displayed on the screens.

Figures 5.13 and 5.14 focus on the game, respectively regarding the tablet and the main screen. Using a paper cup displays the message “With a reusable cup you could have played on the main screen now.” on the tablet which is supported by the animation of a tile being damaged, highlighted by a flash symbol appearing for a few seconds. When going to the main screen and placing the paper cup on the sensor, the following message appears “Sorry, you can only play with a reusable cup (and if you clicked on the tablet)”. On the other hand, using a reusable cup and pressing the button makes a message appear on the tablet saying “Cool! You can now play at the main screen on the other side.” This also triggers a 5 minutes timer which allows the user to play on the main screen within this time frame. Placing his cup on the sensor within the 5 minutes then starts the play mode. If this is done after 5 minutes have passed, the user will not be allowed to play anymore, instead the same message appears, as if he would use a paper cup. Yet, his tiles is randomly added to the virtual cup. The latter also happens in case the user does not go to the main screen at all.

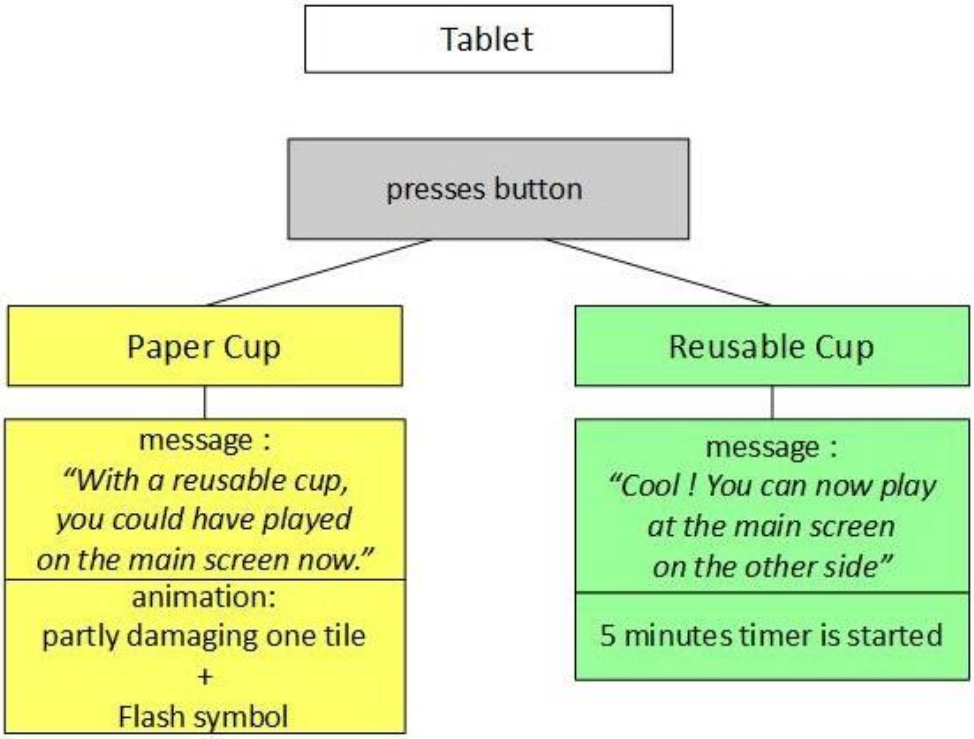

Figure 5.13 Interactions with the tablet during the Game

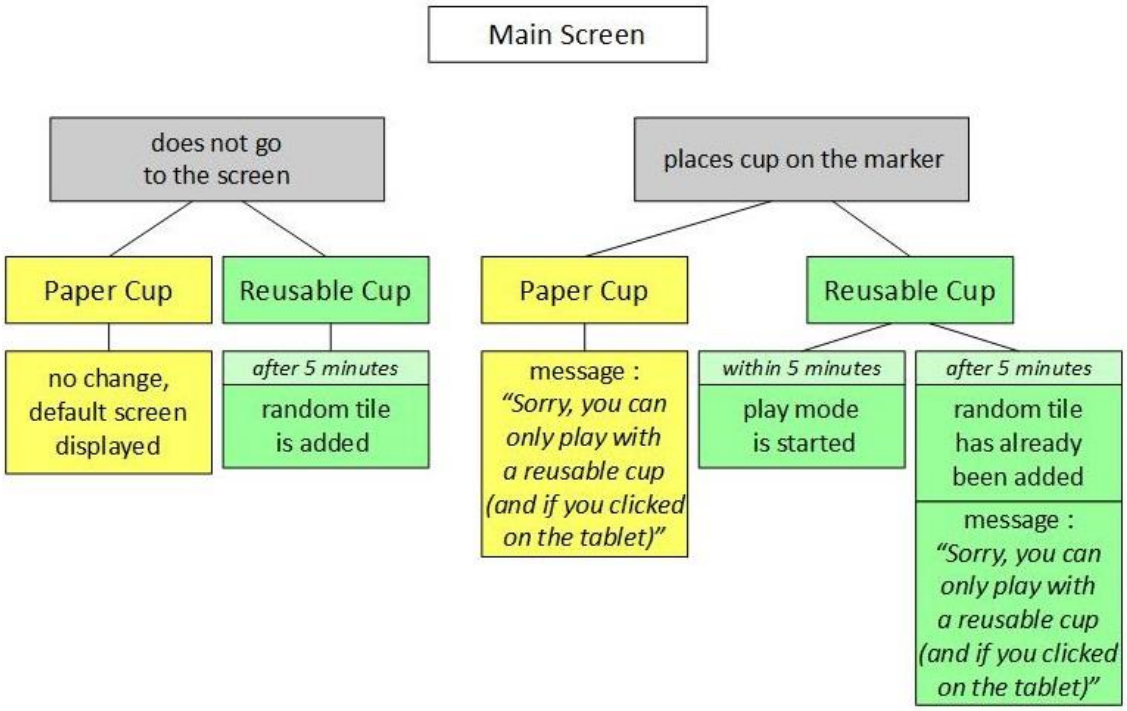

Figure 5.14 Interactions with the main screen during the Game

The Visualization uses almost the same configuration as the Game and so do the interactions, especially with the tablet. They are illustrated in figure 5.15. In case of a paper cup, the

animation with a tile being slightly damaged and the flash symbol is also displayed here. However no message accompanies it. The reusable cup this time makes a tile appear, which is animated to fall from the top of the screen onto another tile within the virtual cup. The position and the color are randomly chosen by the system among the ones that are possible. Here again, no message is displayed. In contrast, the main screen is just displaying the virtual cup and the tiles and updates them each time an action is triggered. There is no real interaction with it, it mainly serves as a feedback support.

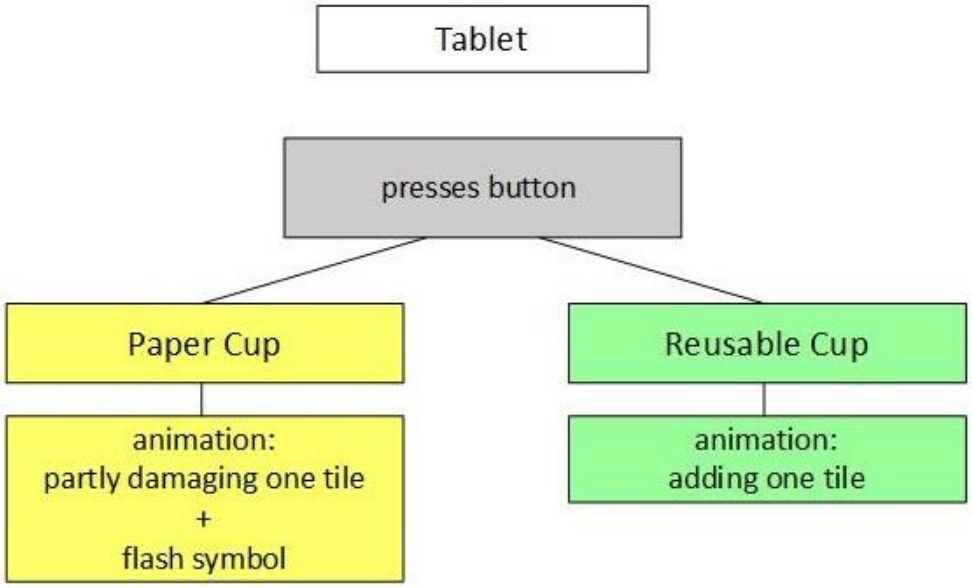

Figure 5.15 Interactions with the tablet in the prototype Visualization

The different aspects of the prototype have been largely described, and in a theoretical way they could be applied to any place meeting the main requirements. Their actual implementation in the chosen café and the conditions of their use are the topic of the next section.

5.6 Phase 5 - User field study

The essential part of this thesis was the user study that was conducted in the field in order to test the developed concept with the help of the prototype. This section will cover the preconditions, the setup and the actual conduction of the user field study as well as its analysis. Since the study was arranged to be adapted to the location it would be conducted in, the following will first give a short description about the café and its preconditions.

5.6.1 **The Location**

Café Linsen is a café at Chalmers Johanneberg that offers coffee and pastries as well as lunch. Although it is open to the public, it is mostly visited by students and employees of the university. The café is open on weekdays from 8.45 to 16.00 but closes one hour earlier on Fridays. Yet, people can use the locations even outside the actual opening hours. Our observations showed that, generally, it is a well-frequented place and especially busy during lunch time, when all tables are taken. At that time, the majority of customers are teachers and other employees of Chalmers. The rest of the day, many students use the space to work on projects and to study. There are both customers who come to get a coffee for takeaway as well

as customers who stay there for a longer period of time, some even without buying anything at the café.

Figure 5.16 The counter at Café Linsen

The counter, as the main point of interest for the study, is arranged in the following way (figure 5.16): to the furthest left, the plates and cutlery for the lunch are placed together with the ceramic cups. Next to it is a vitrine which contains sandwiches and other snacks, followed by the coffee machine and the paper cup stacks next to it. Moreover there are plates with pastries and fruits right of it as well as the cash register. Furthest to the right of the counter is the place where food is handed out during lunch. This setup makes people queue alongside the counter allowing them a fluent procedure when purchasing lunch. Usually, the process of buying coffee starts by choosing the cup, filling it with coffee from the machine, paying for it and then possibly adding milk, sugar etc. which are mostly placed on the right side of the register. Yet, during lunch another container with coffee as well as the extras like milk and sugar and paper cups are placed on tables opposite of the counter to allow better access for the higher amount of people at that time.

The given preconditions highlight that people's choice of cups might be influenced by the different positions of the cups. Whilst the paper cups are placed directly next to where they are filled with coffee, people have to walk further to get one of the ceramic cups. Nevertheless, compared to the other locations we had targeted, Café Linsen seemed to be most appropriated. One reason is that people can choose between paper cups, ceramic cups provided by the café and bringing their own cups. With this, people are not already restrained in their choice of cup by the café's policy. Moreover, the environment seemed to support different kinds of people staying over different periods of time which was interesting for us whilst posing a challenge for testing our concept. Lastly, the staff at Café Linsen was very helpful and open towards our concept we presented them.

Introduction of the system

Introducing our prototype was done based on the observations realized in Phase 2. The main requirements that we elected were to break as little as possible the flow of getting a coffee,

meaning the installation being easily accessible, or even offering the possibility to ignore the elements, and to be visible from different parts of the café. Figure 5.17 below shows a schematic of the arrangement of and the interactions with the elements at the café, the grey colored steps representing the usual process of buying a coffee.

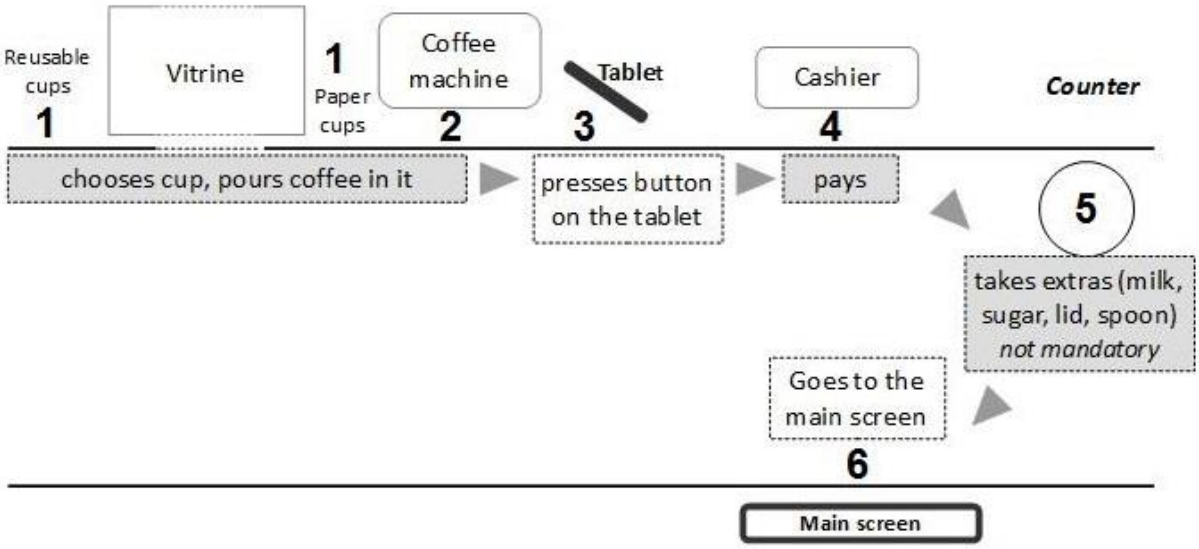

Figure 5.17 Schematic of interactions with the Game

Since the reusable and the paper cups are not available at the same place (1 in figure 5.17), the position elicited for the tablet was right next to the coffee machine (3). This way the tablet can be seen when pouring coffee into the cup (2) and provides personal feedback. The interactions with it for both versions of the prototype were described in the previous section. The following steps are paying at the cashier (4) and perhaps adding sugar or milk as well as getting a plastic lid or a wooden spoon for the paper cup at a small table placed in front of the counter (5). The main screen on the other hand is located on the opposite side of the hallway across from the counter (6). This way it can attract a larger audience and provide a general overview of the virtual cup. This position also has the advantage of being away from the queue so people can freely play without worrying about annoying others waiting after them. This final step is important especially in the Game, but is not mandatory in the Visualization as already explained in the description of the interactions with the screen for both versions of the prototype.

5.6.2 **User Study**

Aim of this study was to find out how people would react to the introduction of our prototype, how and if they would use it and if it could be regarded as tool to change their behavior. Further, it was about investigating whether the second version with added game elements would be more attractive and used more than the simpler visualization version.

5.6.2.1 General setup

The study was divided into three parts, which lasted one week each. Firstly, a reference study was conducted that would help compare the situation before and after introducing the prototype. Week 2 started with introducing the first version of the prototype - Cup Builder - the Visualization. Lastly, Cup Builder - the Game was introduced in week 3. Everything took place at Café Linsen at Chalmers Johanneberg in the three weeks before the exam week and the end of the semester. All three weeks were accompanied by frequent fly-on-the-wall

observations of the set up as well as occasional short conversations with participants that approached us or vice versa.

The prototype was installed so it would be accessible for every customer of the café, aiming to reach as many users as possible. Yet, in order to have the chance to get detailed information from few that would have a closer look at the prototype, participants were recruited that would use the two versions of Cup Builder during week 2 and week 3. This is also dictated by the need to analyze the whole concept, which is larger than what is shown in the prototype. Putting up flyers on the walls at the café as well as several attempts to find participants via social media, unfortunately, were not successful so we were required to actively approach people who visited the café. Yet, we ended up with 5 male participants, who claimed to go to the café frequently (several times a week), some of them staying there during the day, some of them taking away their coffee. The location of the café in a way determined the target group of our study as being mostly male students of an engineering related program. Therefore we did not have much choice of getting representatives of both genders, neither did we have much influence on picking participants that would equally represent customers using paper cups and customers using reusable cups.

5.6.2.2 Week 1: Reference study

The first week served to introduce the tablet for the first time. In this case, the interface only showed two buttons, one saying ‘paper cup’ one saying ‘reusable cup’. The tablet was set up directly next to the coffee machine (figure 5.18).

Figure 5.18: Setup of tablet in reference week (week 1)

Day 1 of this first week served as a pilot day. Frequent observations helped to find out what additional information was needed to draw people’s attention towards the tablet and to see whether and how the interactions would happen. It made obvious that it would be important to give hints for people to not miss the tablet, since it was ignored quite often in the beginning. In contrast, other people pressed although they did not have a coffee which gave the impression they thought this was just a general survey about their preferred kind of cup. Therefore, small adaptations were done such as paper notifications on the coffee machine

pointing to the tablet, as well as the request to press the according button after taking a coffee and that this was part of a master thesis with the aim to measure the consumption of cups. On the other hand, quite some people actually stopped, seemed surprised about the tablet as well as interested. Another change that was made after that day was adapting the timing of the feedback for the different states of the button, which would change their appearance when being pressed and released. This was a result of observing people pressing the buttons several times as they were not sure if their action had been registered. It also became clear that a minor part of all people purchasing coffee did not press the according button. Another situation appeared which made it more difficult to keep track of all people getting coffee: during lunch the staff usually places another coffee container and stacks of paper cups on the other side of the counter. This excluded people getting their coffee from there since our tablet was not positioned next to it.

Yet, the tablet helped to get a rough number of how many of each kind of cups are used during a day. In addition, it was attempted to count the actual number of paper cups used on one day. For this, the cashier was asked to count all paper cups she would provide and put on a stack next to the coffee machine which was then set against the number of cups that were already there in the morning and the ones that were left in the evening. In this week 1 in average 120 paper cups were used per day and 30 reusable cups according to how often people clicked on the buttons. In contrast to that, the number of paper cups that was counted by the cashier during one day was approximately 180. Nevertheless, the number of button presses instead of the number of actual cups used per day was used to balance the visualization. This seemed more appropriate considering the assumption that people who pressed the buttons in week 1 would more likely keep using our prototype than those who did not even contribute then. Trying to balance how many tiles should be needed to fill the cup and how much impact one paper cup should have was done considering the number of roughly 600 paper cups and 150 reusable cups per week. The decision was made on having a total of 63 tiles that would fill up the virtual cup in 9 rows à 7 tiles. Since paper cups were the majority of cups used in the café their value was set to one fifth of a reusable cup. This means it would take 5 paper cups to destroy one tile. In general, the aim was to make it possible to nearly fill the virtual cup within a week. The reference study therefore helped to find a balance between making it too easy and too difficult to reach the goal which both could otherwise be discouraging for the users. That is why it was also decided to start the next two weeks with already one complete row of tiles in the virtual cup to prevent the cup from becoming empty in the very beginning. Lastly, the reference week served to prepare the customers at the café for the introduction of a new kind of technology that would be an important part of our prototype.

5.6.2.3 Week 2: Cup Builder - the Visualization

The first version of Cup Builder including the main screen was added during week 2 of the study. The tablet was still at the same position next to the coffee machine, while the main screen was located at a more visible spot, where everyone passing by could notice it (figure 5.19 a/b). Like the previous week, people were supposed to press a button on the tablet according to the kind of cup they were using. This time, however, they could directly see the impact of their choice thanks to animations on the small screen. Real time feedback was provided here in the sense that pressing the button ‘reusable cup’ would make a new tile appear on the tablet screen whereas pressing ‘paper cup’ would make one fifth of an existing tile disappear which was highlighted by an animated flash. The main screen, on the other hand, simply updated the new status, either removing or adding a tile, but without directly highlighting it. Since the purpose of this week was also to find out how intuitive the

visualization was and how people would understand it, there were no further instructions or information added. A sheet of paper attached to the main screen only indicated that it visualized the consumption of the different kinds of cups and that what was shown on the screen was dependent on which button people pressed on the tablet.

Figure 5.19 (a) Tablet and (b) Main screen of Visualization in week 2

The addition of the main screen drew people's attention so we could observe groups of people standing around it, reading the info paper and starting discussions. Some even tried touching the screen. Few also approached us, asking questions about the purpose and how it works, also presenting us their own theories. Regarding the tablet, we could observe that some people pressed the buttons several times, some because they did not see a reaction and some because they saw a reaction and wanted to try it again. This assumption was confirmed by some comments we received. Looking at the numbers that were stored in the database it appeared that, in general, the buttons were pressed more often than in week 1. Yet, it is difficult to say if this is due to the fact that it there was really a higher consumption of cups. In fact, we assumed that the introduction of the Visualization made people curious and motivated them to contribute.

5.6.2.4 Week 3: Cup Builder - the Game

As the second version of the prototype, Cup Builder - the Game was introduced in week 3, mainly meaning the addition of physical buttons and other game elements to allow interaction with the main screen. Since the first day actually functioned as fixing bugs in the code and could not be used to test the prototype, the study was prolonged one day, so that week 3 lasted from Tuesday until Monday of the next week which was also the exam week.

People still were required to enter their choice of cup on the tablet next to the coffee machine, but the major interaction was realized with the main screen. Pressing the button 'reusable cup' started a timer of five minutes during which the user was allowed to play on the main screen. Placing the reusable cup on the dedicated spot then triggered the play mode in which the customization of the personal tile could be done by pressing the physical arrow buttons and the OK button. By putting a cup on the sensor without having pressed anything or after pressing 'paper cup', the play mode would not be activated and instead a popup informed the user why he was not allowed to play. This week, the information sheet next to the screen contained the instructions of how to play the game as well as a summary of what the different actions triggered and what the visualization represented.

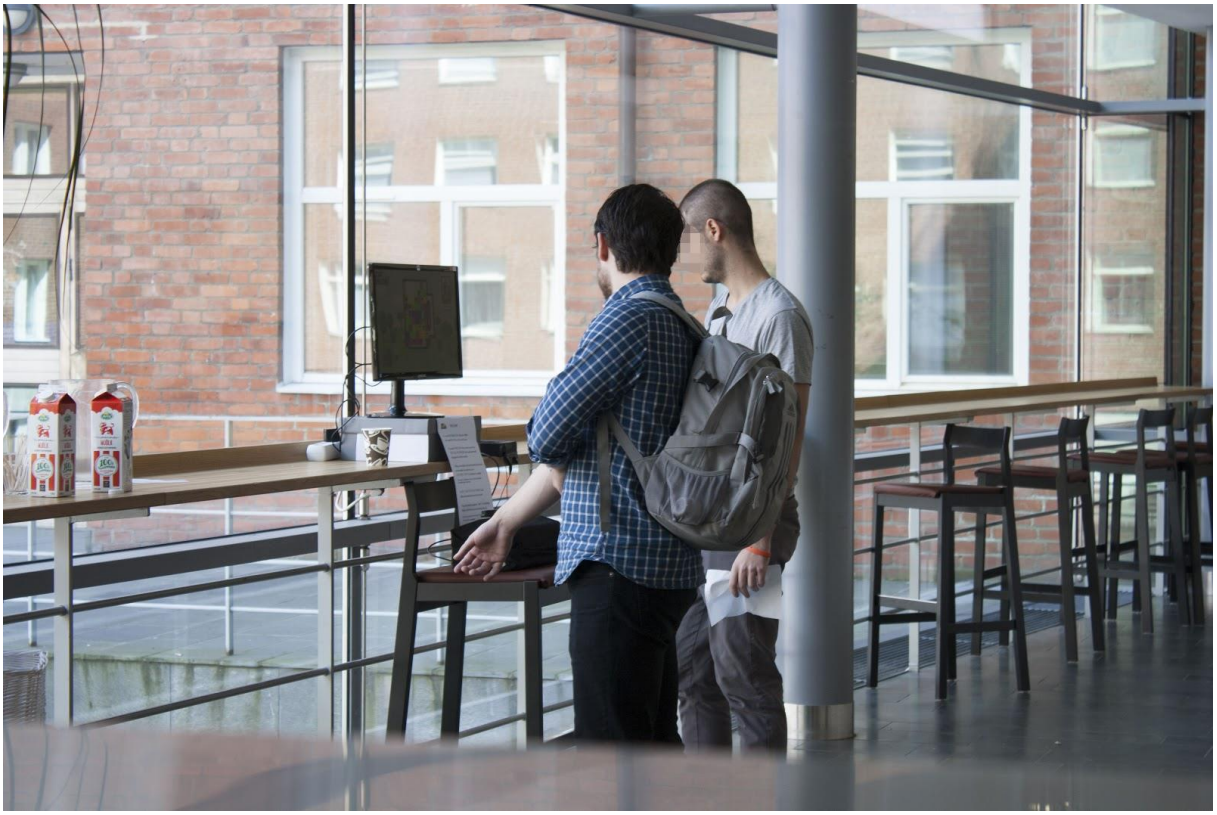

Figure 5.20 Customers discussing about the prototype

The observations during this week indicated that people were still very curious about Cup Builder. Again groups of people frequently gathered around the main screen reading the instructions and trying to play the game (figure 5.20). Even though the majority of the people were using paper cups, they still tried to put their cups on the sensor. Some seemed surprised, some disappointed about the fact that they were not allowed to play and instead got the feedback on the screen that they would need a reusable cup to play. Many of those tried several times to use their cup as identifier, pressing it harder on the sensor with the aim to trick the system which was yet not possible this way. The statement “But I want to play” that could be heard from one person approaching the screen with a paper cup sums up this impression of slight frustration that we could notice with several other people. The numbers of 60 paper cups and 30 reusable cups in average represent a decline in cups that have been registered via the tablet. And considering the number of 140 paper cups actually measured during one day this shows that it is possible that this decline happened because of less people pressing ‘paper cup’. By detecting the amount of personalized tiles out of all tiles that were added to the virtual cup we could see that around 40% of the people who were allowed to play the game actually did it. Observations showed that especially during lunch a lot of reusable cups were used but were not followed by people playing the game.

Unfortunately not all of the participants we had recruited were actually available for interviews in the end which is why we could only conduct two group interviews with four people in total. The interviews were held in order to get detailed qualitative data from the participants. Also, since the study ran over a long period of time and consisted of two different parts, some questions were sent to the participants at the end of week 2, as an incentive to already analyze the visualization a bit. They should then only need to refer to their thoughts during the interview. As another incentive that would motivate the participants to be part of the study, we handed out several coupons for free coffees at Café Linsen at the end of week 2 and as a reward after the final interviews.

5.6.3 **Interviews**

The semi-structured interviews were held in pairs over approximately 40 minutes each and happened in the presence of both us the designers in the context of the café. The aim of these interviews was, first of all, to see how the participants understood the two versions of the prototype and whether or not they could imagine this kind of intervention to change their behavior. On the other hand it also focused on understanding how gamification could influence people in the studied context, more specifically, how the different game elements could affect their motivation. Therefore, a set of predefined questions helped to cover all important aspects but it was necessary to allow the participants to evolve their thoughts freely to get more detailed feedback. The first questions dealt with finding out how and how often the participants had used the prototype and whether or not they understood the actual purpose of the study, since we did not tell them about it in advance. The general structure of following discussions then was built on analyzing the two different versions of the prototype which the participants were asked to explain shortly in their own words. In addition, since the game was still installed at that time, the prototype was tested once more and the participants would think aloud while playing. After that the interviews were directed towards the game and its different elements. The elements such as collaboration, competition and customization as the ones that had been implemented were discussed to find out if and how they worked. Beyond that, other elements that are part of the bigger concept were pointed out and discussed as well. During the interview, the participants were encouraged to give own suggestions of what to add to and remove from the existing prototype. Lastly, the possibility of a behavior change amongst the participants and people in general was touched upon again.

In addition to these extensive group interviews, more short interviews were conducted on the last day of the study. Four groups of each 2-4 customers of the café that used both paper and reusable cups were asked question with the aim to detect if people understood what the Cup Builder was about and whether or not they used it. These interviews were more intended to get an overview of the general impression that the prototype had on customers of the café. Therefore a more structured interviews with only few questions was appropriate.

Both kinds of interviews gave valuable insights into how the prototype was perceived by the customers of the café. They also revealed a significant difference: the participants, who had been encouraged to spend more time with the prototype, had a quite good understanding of its purpose. The interviewees of the short interviews, on the other hand, mostly claimed that they did not understand the different actions and what was visualized on the screens and neither the general concept of Cup Builder. Besides, they required more precise feedback, which was also highlighted in the paired interviews. The latter could focus more on details and resulted in different suggestions of improvement by the participants.

5.6.4 **Analysis**

The transcriptions of the paired interviews were main source for the analysis of the user study. They were not transcribed word for word but already with the aim to filter the essential part of the participants' comments (see Appendix D). A first analysis was, so to say, already done while listening to the recorded files. This was done out of time reasons but also because we already had a good enough impression of the main outcomes directly after the interviews. The important statements were highlighted and then collected as one set of key points. They were then grouped by aspects: graphics, location and interactions, time, competition versus collaboration, motivations and behavior change. The category of graphics takes into account the role and the relevance of what was displayed in both versions of the prototype, comparing their impacts. Location and interactions focuses more on the process of getting a coffee and

playing the game. It also criticizes the information conveyed by the system. Time is a category on its own, since all participants insisted several times on this parameter as their main concern and with a strong vocabulary. As core mechanics of the prototype, competition versus collaboration analyses the strength of each and the balances between them. Motivations groups all the elements included in the prototype and further in the concept that make people feel attached to the evolution of the cup and keep them involved in playing the game. Finally, as the aim of the study, behavior change is the result of a self-evaluation about participants' personal attitude during the study and later, if this were to be continued.

This analysis is completed by other sources of data, observations and the short interviews with random customers. Those were more revealing regarding the general impression of people towards the prototype and were mostly supporting the findings from the interviews with the participants.

5.6.5 **Result of User Study**

The study aimed primarily to compare the perceptions of the different versions of the prototype followed by an analysis of the strengths and weaknesses of the game elements. This section will describe the insights gained with the interviews that were conducted with the participants and with other customers of the café as well as the findings from the observation, which represents qualitative data. Besides, in the following, the people that were participating in the entire study will be called participants, whereas the people asked in short interviews in the end will be referred to as interviewees. Additionally, an overview of the quantitative data collected throughout the three weeks of the study will be given.

Qualitative data

The interviews conducted with the participants or other customers and combined with the observations show different levels of understanding of the installations.
The main focus and the purpose of the study - investigating behavior change related to the choice of cup at a café - had not been explained beforehand to the participants. The answers showed, however, that they were able to make assumptions pointing in that direction. Whilst the week with the Visualization allowed them to only guess, their thoughts could be confirmed during the week with the Game also due to the fact that the instructions next to the main screen gave clearer hints then. Although none of them mentioned the keyword 'behavior change', they suggested the study was about raising awareness about waste, influencing the choice of cup and that we aimed to make people choose a reusable cup instead of a paper cup. This showed a relatively good understanding of the meaning of Cup Builder for their part.

The observations during the study revealed that both versions of the prototype caught the customers' attention, groups were formed in front of the main screen and discussions emerged. This is mainly due to the novelty of the installations in the café. Yet, the participants stated that they quickly lost interest in the Visualization while they spent more time using the Game. There are several reasons for this reaction. Firstly, one participant had issues understanding the impact when he used a paper cup and therefore wondered about the purpose of it. Even after he realized, after a while, that a part of a tile disappears when pressing 'paper cup' on the tablet, it did not further arouse his interest. This obstacle of not understanding what it visualized also made two other participants not look further at the screens in the beginning. Additionally, all of the interviews stated that they had difficulties apprehending what the screens visualize and consequently did not understand the purpose of the prototype. Another important factor for the decrease of interest is the absence of challenge that was posed by the Visualization. Once pressing the button on the tablet had been done a few times,

the principle was understood and the attractiveness reduced. This part was even compared to the kind of application that can be found in some stores to rate the customer's satisfaction. It was highlighted that in this example pressing a button is not very meaningful to the user but that they would do it anyways as it does not involve much effort.

One big advantage of the Game compared to the Visualization was that people tend to show curiosity towards the concept of 'game' which results in the wish to try it out. This is underlined by observations that showed many people trying to play the game even though they were not allowed to. The rejection they got from the feedback on the screen, saying they had to use a reusable cup in order to play, made some even try harder looking for ways to trick the system. One person standing in front of the main screen was even heard saying in a frustrated tone "But I want to play". Thus, this negative reinforcement rather led to disappointment than motivation to changing behavior. This could also be seen in the answers of the interviewees who mostly stated that, since they were using paper cups and therefore could not play, did rather not spend more thoughts about the game. Yet, interestingly, after we explained them the concept of the game, two of the interviewees went back to the prototype, this time with a reusable cup, and actually played the game. Furthermore, several of the other people asked, claimed that they would look more carefully at the prototype the next time they would get a coffee since they now knew what it was about.

Another fundamental aspect of the Game appeared: the obligation to spend a certain time in front of the screen. It was pointed out that the necessary interactions to play were simple but efficient and therefore fun. Having to spend some thoughts about the customization and the position of their contributing tile made the participants think deeper about the purpose of Cup Builder. This seemed to have contributed to understanding the purpose of the prototype as the previous remarks showed. Moreover, playing was more stimulating than simply observing the consequence of pressing a single button on the tablet, since it was involving the users in many ways: taking decisions, interacting with the system and adding a personalized contribution. Participants added that it was much more interesting to follow the virtual cup's state during the Game than during the Visualization. A reason for this was that they did not understand the randomness of the tiles that were added during the first version and looked for a deeper meaning that they unfortunately could not figure out. Finally, the role of the main screen was important to raise curiosity but lost any relevance when the participants understood it was basically the same cup as the one that was displayed on the tablet during the Visualization week. Their expectations that something else would happen on the main screen where not met.

Part of the interviews in pairs focused on the technology used and the feedback provided in the prototype itself. According to two participants, the position of the tablet was not appropriate since it was not very noticeable and thus, several people might have missed it completely. This could be observed several times when people passed the tablet without pressing a button. Yet, this was potentially due to them not seeing or simply ignoring the tablet. The visual appearance and style of the game as well as the interactions with the main screen were enjoyed by the participants. Using the cup on the sensor and the oversized buttons were perceived as fun. Nevertheless, the feedback provided when someone pressed the 'paper cup' button was, in their opinion, not encouraging enough to make customers willing to press the button next time they would take coffee. Some participants mentioned that the animations should be more obvious to be sure that they are seen. Similarly the changes in the background on the screens were not noticed at first, but after hinting in that direction, half

of the participants discovered that it was more crowded and that the trees and bushes had not been displayed at the beginning.
One participant mentioned that within this short period of time when the study was held, these kind of modifications were not easy to detect. The changing of the background was really appreciated though and the idea to add animals, motion caused by wind and some simple animations was even suggested to improve it. Moreover, the participants required more precise information, facts and numbers about the consumption and what is shown on the screen, in order to facilitate the understanding and to help people follow the current state of the game. One interviewee added that the visualization was too vague and that actual numbers would have potentially made him more motivated to have a closer look.

At some point in the paired interviews we mentioned the possibility of extending the system to a website or an app and the reaction was unanimous: this should stay within the café. The context seemed to be important and one participant highlighted that the whole point of the game for him was to be able to show his contribution to his friends and that it would be weird to do it outside of the coffee place. He would not even want to check the status of the virtual cup from another location. Other participants were more nuanced, saying that an image of the virtual cup in the background of their phone could be a good idea because people would not willingly open an app or look at a website to get updated. Making efforts installing something on their own device seemed to be an important obstacle. When introducing the idea of displaying the contribution on the personal cup, the participants seemed rather unimpressed but stated they could imagine such extension. Generally, the participants expressed more interest in the reduction of the amount of time they would have to spend to add their tile than in showing off their contribution like this. A concern about the potential tracking of the consumption habits linked to the concept of a personal cup was raised but this issue is solved if the identification is anonymous.

Time seemed to be the necessary key of success for the Game, according to the participants' statements and to the frequency they talked about it. The game being short and simple was what made them play in the present context. Observations and the interviews showed that customers of the café were very likely to be in a hurry and therefore not very willing to even consider the prototype, either because they were studying or because they were going to another place. However, if they would have noticed that it does not require much from them and assuming that they would enjoy the game, they might have played it anyway. The threshold of taking a closer look and trying to find out more, was often simply not passed. Reading the instructions also seemed time consuming, yet important for understanding the challenge. Nonetheless, this was only an issue for first time users and not required later on thanks to the simplicity of the concept. Another relevant factor was lengthily discussed: the choice to actively contribute or not. The participants thought it was an advantage that the system automatically added the tile after a while because people then would not feel forced to play. This thought can also be applied to the concept of mini-games during which people should be able to refuse to play them but still be allowed to personalize their tile.

The core of the game is based on the personalization of the different building blocks. Thus, we were especially attentive when the participants were discussing the pros and cons of this aspect of the prototype. It turned out that they enjoyed the idea and would like to see it further developed to be able to identify themselves more with their tiles. This identification was more difficult in the actual state of the prototype because only customization, which means personalization among a limited amount of choices, was available. They did not have a strong feeling towards their tiles and even if they were able to find them on the screen, they did not

really keep track of them and were not willing to show them off. This was enhanced by the fact that because of the limited amount of choice someone else could have added an identical one which would make it difficult to distinguish them. The issue could very likely be solved by allowing them to add a letter or even pictures of themselves (taken with a webcam), draw their own sketches on a tablet and upload them to be displayed on their tile. Interestingly, the participants came up with these ideas themselves even though they were part of the concept features we had not mentioned until then.

All these remarks cover the individual aspects but the discussion shifted towards more general aspects and some relevant ideas were formulated. Two participants imagined that the goal could not be to be the first to fill the one virtual cup but rather to have one virtual cup for each week. This would then mean starting all over with an empty cup for every week and the previous cup could be displayed in a corner as a history. By doing so it would allow people to compare the several cups, which represent the weekly consumption and to see when the café performed best. It would then target everyday customers that could see a quick evolution within the one cup as well as customers that come once in a while since they would get an overview of the consumptions over a longer time. In general, following the status of the cup and the personal contribution seemed to motivate the participants which is, as already explained, one strength of the Game. However, this motivation was, as stated by the participants, also due to the competition with the other coffee place, either because “it always feels good to win” or because it showed that the same thing is happening somewhere else and they felt a certain connection. In both paired interviews, the discussion started by a question from the participants about the Café C, which shows that they kept an eye on it. Their disappointment, even slight, when we confessed it was all simulated was also interesting from that perspective. In addition, one participant highlighted that for him the competition feeling was not only directed towards this other place but also towards his fellow coffee consumers. Comparing his performance with friends would motivate him a lot, possibly even more than competing with strangers. This tendency of seeing the game as a competition rather than collaboration for him also made the feature of a combination tile with friends not very appealing. All in all, these different remarks illustrate the relative weak impact of a targeted goal for the game. Providing an objective is important for attraction, but the end of the game is not the central key for the interest.

Another important question was addressed concerning how to keep the motivation up over a longer time. In the current state of the concept, participants explained that they would only play for a couple of weeks maximum. Adding levels to increase the difficulty over time was perceived as an interesting way to make the users worry about their contribution and care even more about the whole virtual cup. Yet, the mini-games that should accompany this step did not trigger any special enthusiasm, especially, since the participants were rather concerned about the time that would be required to play them. Most participants also thought additional games would not add any more value, except maybe if their topic would cover the cup consumption as well. They were more interested in the idea of the random reward spots and imagined it could add to keeping up their motivation. Next to the previously mentioned additional features of the game, they were asked about possible external rewards, like free coffee, which they could receive in certain cases. Surprisingly their answer was that it was not really required to make them play. Further, they argued a scoreboard would have more effects on them and their motivation than the perspective of winning something small. On the other hand, they admitted that it could be a good way to attract new users.

Lastly, behavior change, as the central point of the study was discussed during the paired interviews. Indeed the study had a certain impact on the participants and their behavior. Two of the participants were already using reusable cups before the study in the case of staying at the café, whereas the other two used to take paper cups. The reasons for the latter included not staying at the café, mistrust about the cleanness of the reusable cups and not being aware of their availability or of the possibility to bring an own cup. But, since they were recruited to participate in the study, they all used reusable cups during the two weeks. The question now is: would they continue afterwards? All participants claimed they would try their best because playing opened up their eyes which means raising their awareness has been a positive side effect of the prototype. This is essentially true for the participant that did not know about the reusable cups in the café. He even brought his own cup when he understood that he was allowed to. The participant who had been wondering if the cups were well cleaned explained that the game convinced him to use them anyway and that he would keep that behavior from now on. On the other hand, a negative side impact affected one of participants: he was so involved in the game that according to him he doubled his consumption. It seemed, however, that this reaction would be only temporary and that he would be more reasonable if the game lasted longer. Since all of the participants understood the main goal and saw it as personally valuable none of them was concerned about the fact that interventions like Cup Builder could be introduced only for the benefit of the café. Finally to expand it to a larger group of people, their guess was that the game could have an impact even after its end when accompanied by specific information about its goal and purpose.

Quantitative data

The three weeks of the user study revealed developments in the number of reusable cups and paper cups used in the entire café. Even though the quantitative data could show a certain trend, it is to be noted that they cannot be seen as very valid. Nevertheless, the following will give an attempt of an analysis of the measurements that resulted from the tablet inputs and the manual counting of the cups.

Although there were difficulties measuring the actual amount of paper cups, it was attempted on one day in week 1 as well as in week 3. These numbers show a decline of the consumption, represented by 180 paper cups per day in the beginning to 140 cups per day in the last week of the study. It was not possible to measure the actual consumption of reusable cups, but a reasonable guess is that it also reduced, resulting from less customers visiting the café, even though a optimistic (but unlikely in such a short time) reason would suggest that people changed their behavior.

In the reference week 120 paper cups and 30 reusable cups were used in average every day when considering the button registrations on the tablet. Week 2 and the introduction of the Visualization increased the daily average number of paper cups to 160 and 50 for the reusable cups. Lastly, week 3 resulted in a general decline of both numbers to 63 paper cups and 30 reusable cups in average per day. This confirms the theory of less people coming to the café over the behavior change. The ratio of reusable cups per day evolved positively though slightly over the three weeks. In week 1 reusable cups represented 20% of the total consumption measured thanks to the tablet, whereas in week 2 the amount increased to one fourth and further to around 32% in week 3. This encouraging evolution was however tempered by the remarks from the participants about the effect of the discouraging feedback. According to them, this feedback made people with a paper cup less willing to press the button on the tablet.

During the third week, out of the 30 reusable cups used and therefore tiles being added to the virtual cup, 50% were tiles added through the customization mode. This means half of the people that were allowed to actually started the game, whereas the rest of the tiles had been randomly added by the system. However, this result includes the times the mode has been triggered, not necessarily completed. Some users began to play but stopped before finishing which resulted in the system adding their tile automatically. This could be due to them not pressing any button within a certain time, them not playing further on purpose and, finally, because at one point a button was broken which prevented them from playing properly. The percentage of fully customized tiles is therefore reduced to 41%. Also, participants recruited to play are included in this number, meaning that the actual amount of people who played without our incentive is lower, at around 35%. However, the general participation of customers increased during the week and it can be assumed that it would have increased further if the prototype would be there for a longer period.

It is not possible to draw more firm conclusions from these numbers alone, either because they rely too much on the customers' compliance to participate or because it was not possible to measure everything. Yet, they are a good support for the qualitative data collected in the interviews and observations.

6 Result

The aim of the thesis was to investigate the influence of gamification on people's behavior regarding the issue of paper cup consumption in a café on a University campus. It is based on TRIBE, a research project the Interactive Institute Swedish ICT is working on with several European partners. Their goal is to build a social game that encourages people in selected public buildings such as schools and offices to change their behavior to be more energy-conscious (TRIBE, 2014). Narrowing down this context, the results that will be described below claim to answer the research questions:

In the context of a public place, how can gamification be designed in order to influence people's behavior towards sustainability? And more specifically: **Can the addition of game elements to a visualization make students use less disposable cups at campus cafés?**

The general approach to this investigation implied a thorough ideation based on literature research and insights from users, involving experts and non-experts and the development of a concept. Starting from there, a low-fidelity prototype named Cup Builder was created and tested which then resulted in the implementation of the high-fidelity prototype in two versions - the Visualization which visualizes the general consumption of cups within the café and gives the user direct feedback and the Game which adds game elements to it. The major part of this thesis was a final user study in the field which made use of these two versions of the prototype and helped to evaluate the different elements of the developed concept. This chapter will highlight the different categories of results that emerged with this thesis. Firstly, it will describe the concept serving as a base for the implemented high-fidelity prototype which will be looked at both considering its different features and its visual appearance. Lastly, keeping in mind all the findings of the literature study and of the user involvement throughout the whole process, a set of guidelines has been developed, which can be seen as support and advice for other designers or researchers working on projects in a similar context.

6.1 Concept

Since the aim of the study was to analyze the impact of gamification by comparing it to a simple way of visualizing consumption without game elements, the concept was elaborated in two parts which have all general elements in common. The focus of the concept is on the actual game, the visualization part being a simpler version of it with less possible interactions. This section will describe only the parts of the concept that were actually included in the final high-fidelity prototype.

The general concept of Cup Builder (see figure 6.1) relies on a central element, a virtual cup within a landscape, which serves as metaphor for the addressed issues - the choice of the cup and its ecological impact. This cup, publically displayed to the customers of the café on a screen, is filled with square blocks or tiles that represent the amount of reusable cups used by all customers of the café. When using a reusable cup, the user earns a tile to be added to the virtual cup in order to fill it bottom up. On the other hand, using a paper cup damages the construction a little by step-by-step removing parts of one tile until it is completely destroyed. This makes it challenging to complete the virtual cup, which can be seen as the main goal. The background is also affected by the choice of cups, meaning that less tiles in the cup results in an empty grassland whereas filling the cup makes flowers, bushes and trees and appear. Whilst this main screen serves to visualize the consumption of cups in the café,

another screen also displaying the virtual cup is placed where the customers make their choice of cup and highlights the direct consequences of their action.

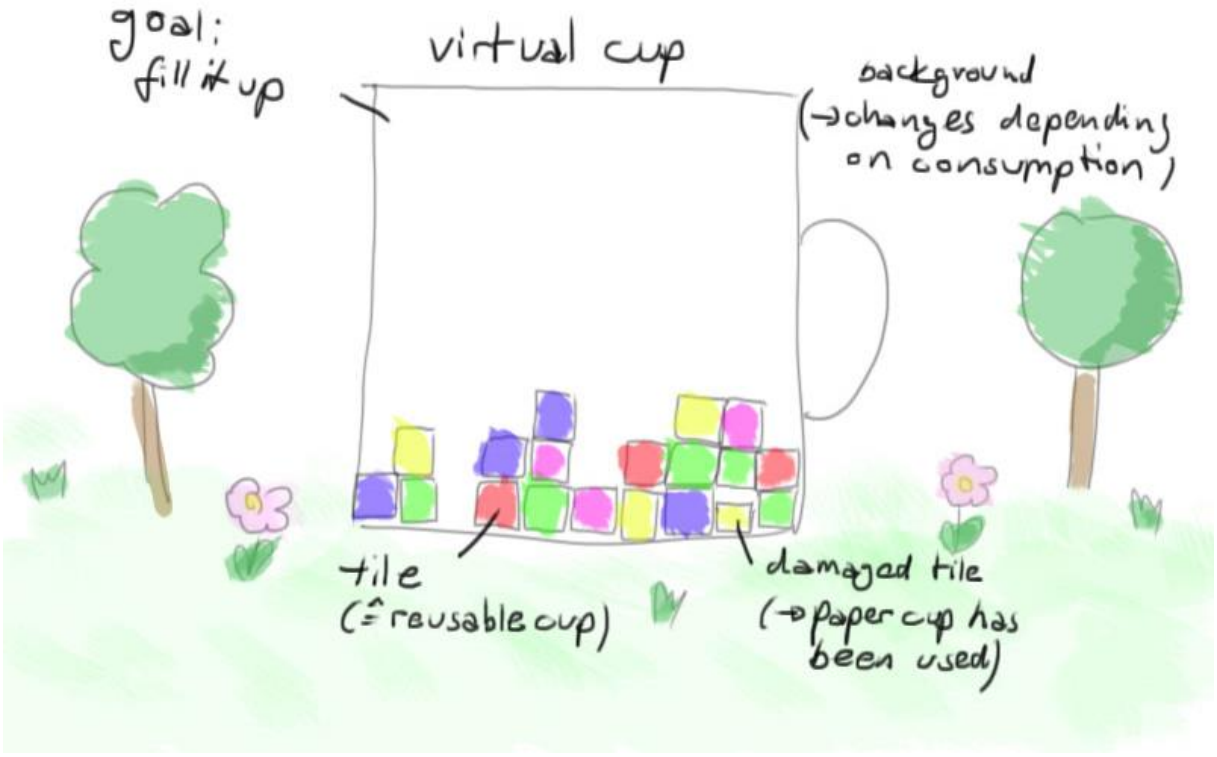

Figure 6.1 Sketch of concept

The user's engagement and motivation within Cup Builder - the Game are addressed with the following aspects. Firstly, the game requires active participation and enables **personalization.** The user can personalize his tile in several ways: he can choose its position within the virtual cup, its color and can add an icon. **Real time feedback** is given to the user in form of animations on a small screen after registering the choice of cups. The entire virtual cup visible on both screens can be considered as a history of everyone's actions as a group. Within this group as the customers of the café, **collaboration** is required to reach the goal of filling the virtual cup. At the same time, **competition** against another café with the same goal is introduced, whose status is displayed in the main screen in a comparable way.

Cup Builder - the Visualization, as said before is a simplified version of the Game with no direct interaction. In this case the user has no influence on the appearance of his tile, in contrast, it is added randomly when he uses a reusable cup. Its color and position are then chosen by the system among the possible choices.

6.2 Prototype

For the high-fidelity prototype only the main concept has been implemented, including the personalization or rather customization of the tiles and the competition against the other café while collaborating to fill the virtual cup. The following section deals with technical as well as visual aspects of this prototype.

6.2.1 **Technical aspects**

As for the devices used for the prototype, the choice was made to use two screens: a tablet to provide the direct personal feedback and to serve as tool to detect the kind of cup and one 22 inches screen connected to a Raspberry Pi 2 for the central interface and the place where the game would be played. Each screen displays a website with the according graphical interface, which are based on the same server with a shared database allowing the devices to communicate and update their status.

One essential feature of the Game is that it is triggered by the kind of cup. This means it can be played by users of a reusable cup whereas users with a paper cup can only be passive observers. That is why at both positions of the interfaces it is detected if the user has a paper cup or a reusable cups which either keeps him from or allows him to interact with the game. The cup itself can therefore be seen as the tool to identify the user. During the study, the tablet placed next to the coffee machine enabled the customers to register their choice of cup by pressing the according button for ‘reusable cup’ or ‘paper cup’ (figure 6.2). On the main screen a sensor would detect whether or not a cup has been placed on it. Unfortunately, an automated implementation of the detection of the cup was not possible within the scope of the thesis.

Figure 6.2 Tablet next to coffee machine showing the Visualization

Opposite of the tablet on the other side of the counter, the main screen was installed to make it more visible to a broader audience (figure 6.3). The prototype version of the Game also included a set of physical buttons and a sensor that would enable direct interaction with this screen. Pressing the button ‘reusable cup’ on the tablet would then allow the user to customize his tile on the main screen by changing its position within the virtual cup as well as choosing its color and an icon to be displayed on the tile.

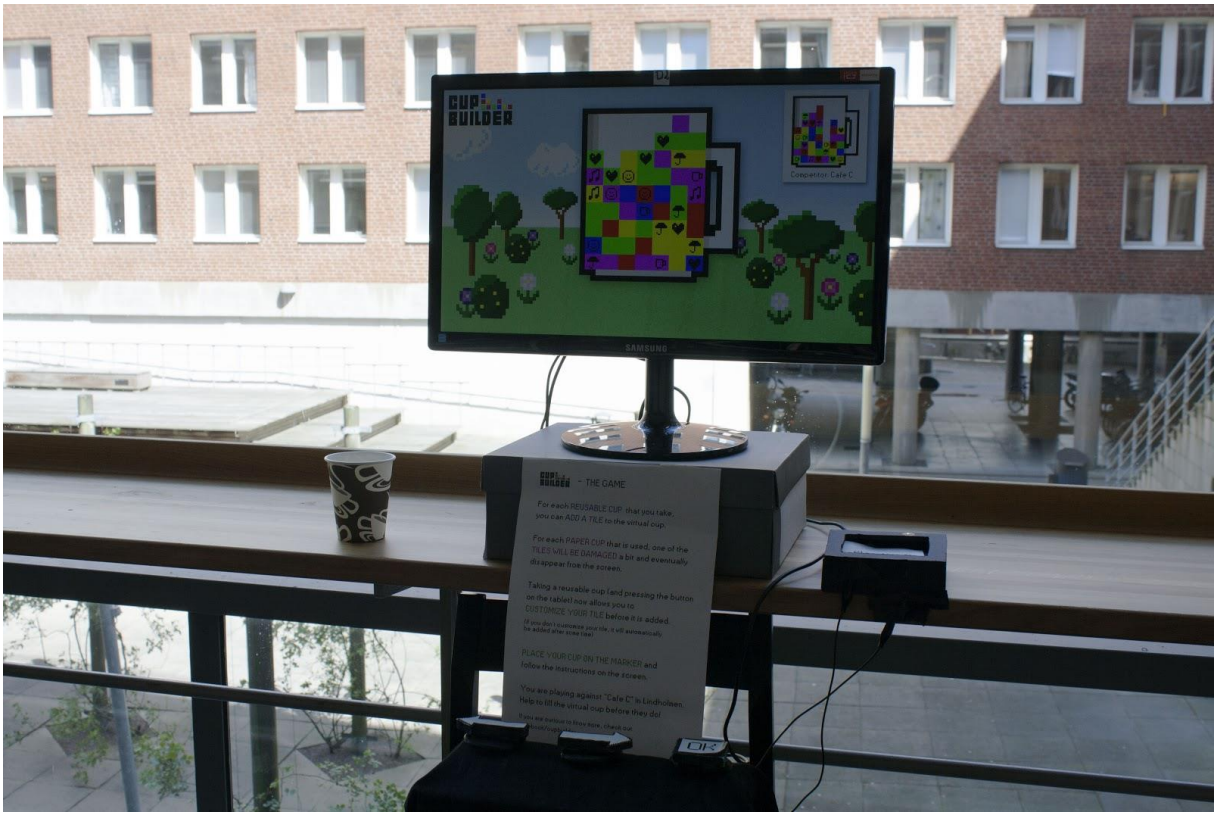

Figure 6.3 Main screen, buttons and sensor during the Game

6.2.2 Visual aspects

The layout on both screens is dominated by the virtual cup, which is the main element of visualizing the consumption of coffee cups (figure 6.4).

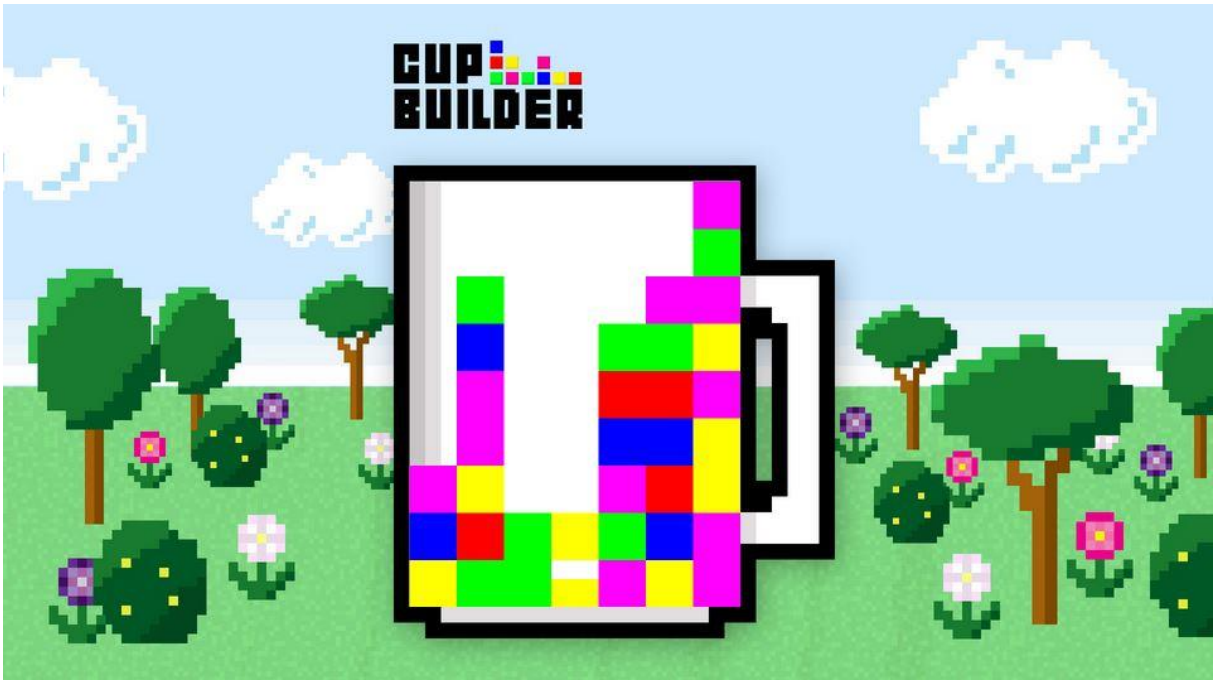

Figure 6.4 Main screen of Visualization

The tiles representing one reusable cup each are visualized in 5 differently colored squares that fill up the virtual cup. In the version of the Visualization these tiles are randomly added,

the color and position do not have a deeper meaning. In the Game these attributes can be chosen by the user himself. As a representation of the environment the background behind the cup displays grassland with flowers when the cup is only poorly filled, while displaying additional bushes and trees when it is filled more. Another element that is present on all screens is the logo which was created to fit within the overall style of the prototype. Besides, it enables the customers to recognize the different elements that are part of the prototype and was therefore also used on the flyers and information sheets promoting Cup Builder.

On the tablet version, the two buttons for ‘reusable cup’ and ‘paper cup’ are placed underneath the cup at the bottom of the screen (figure 6.5). This enables the user to press the button and see the direct feedback without him obscuring the screen with his hand. The direct real time feedback on the tablet is visualized with small animations. In Cup Builder - the Visualization, when a tile is added by pressing ‘reusable cup’, this appears at the top of the screen and falls down to its final position. Pressing ‘paper cup’ and therefore destroying a tile partly is highlighted by a yellow flash symbol that fades in and out in a short time (figure 6.5). Additionally the affected tile would lose one fifth of its height. Since the main screen is not interactive in this version, no animations are visible there.

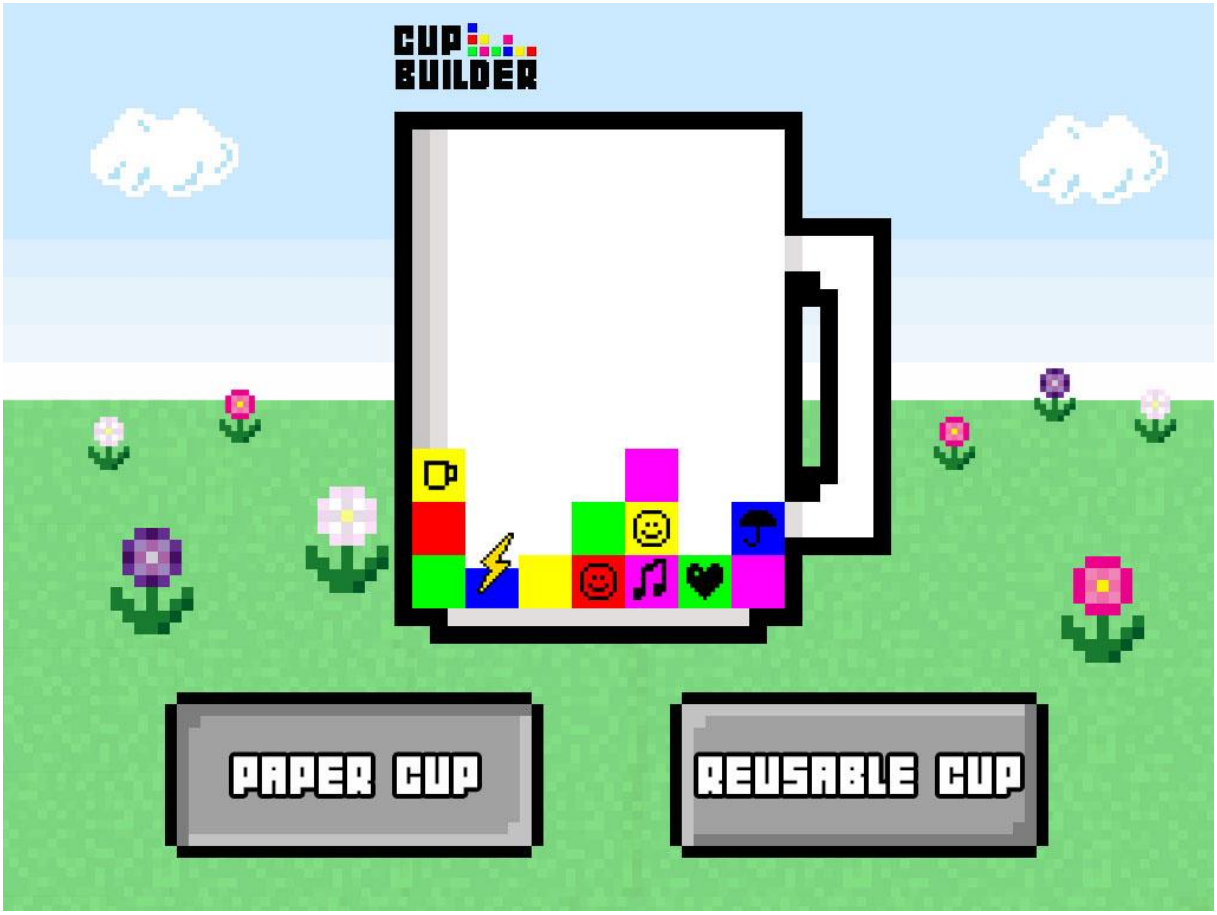

Figure 6.5 Tablet screen in the Game - damage of tile after button press on ‘paper cup’

In Cup Builder - the Game the user gets additional feedback on the tablet screen when pressing a button. This includes a textbox either inviting him to go to the main screen and play or suggesting him to use a reusable cup for the next time instead which would allow him to play. In the former case, instead of a random tile being animated to appear on the screen, the user would have to add it himself. The damaging of the tile, yet, implies the same animation as in the previous version. The main screen now becomes the place where to play

the game which is why certain new graphical elements along with a set of physical buttons are added. The latter comprises three tangible and relatively big push buttons based on a MakeyMakey kit which depict an arrow to the left and to the right as well as an OK lettering. With these buttons an easy and intuitive interaction with the main screen is enabled. Besides, placing a cup on the sensor activates the play mode on the screen. The first step of the subsequent customization is the placing of the tile which is done by pressing the physical arrow buttons to the left or right. Next, the color of the tile is to be chosen which is done by selecting one of the five options from the colorpicker panel (figure 6.6) that includes the colors red, yellow, magenta, green, blue. After pressing the OK button, the user can then choose to add an icon to the colored tile. Again he has five options of icons which illustrate a heart, a smiley, a note, an umbrella and a cup as well as the option of adding no icon.

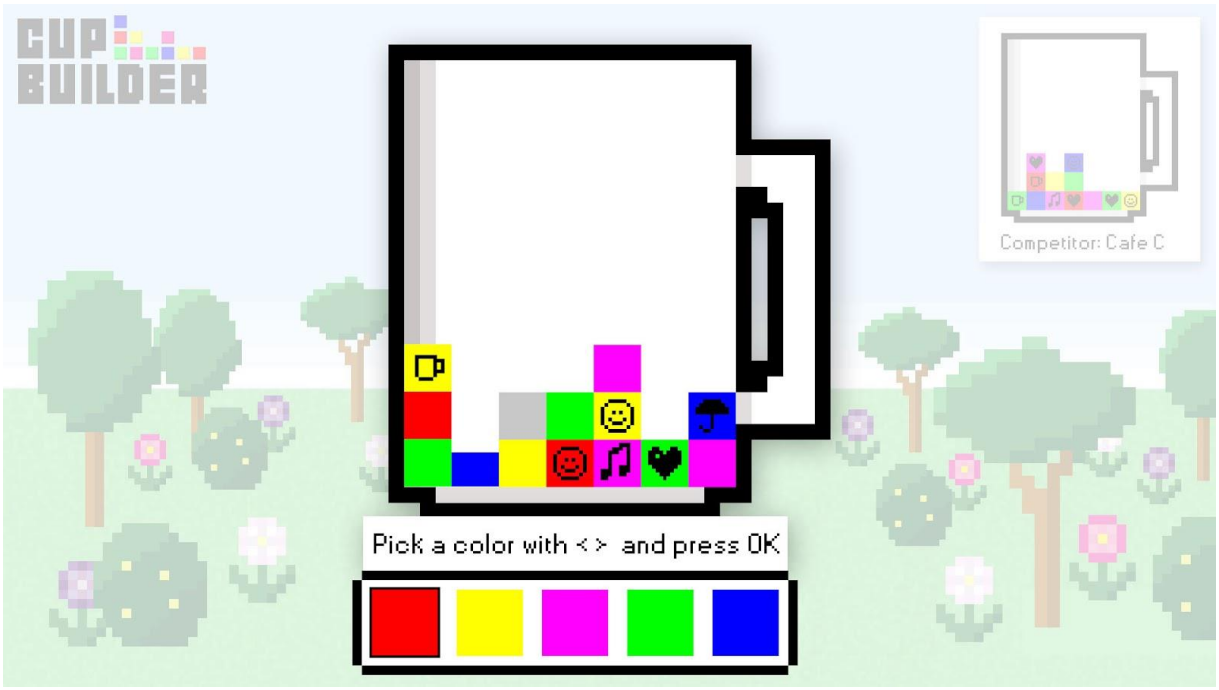

Figure 6.6 Main screen of the Game in play mode showing the colorpicker panel

Throughout this customization the user is given instructions of what to do, such as a text saying “Pick a color with < > and press OK” when he is to choose a color for the tile (figure 6.6).

Lastly, another important element is added in the Game version which implies the competition against another café. The upper right corner of the main screen shows a small version of a virtual cup which represents the cup consumption of another café and allows the customers to compare the status with the aim to stimulate their motivation. Even though this part has been simulated during the study, the competitor’s cup is imagined to be automatically updated just like the own virtual cup in the center of the screen.

6.3 Guidelines

As a result from the user study that has been conducted with the final prototype together with the background information from the literature study, guidelines were formulated for designers and researchers who investigate a similar area. Since behavior change implies motivating people, most of the guidelines focus on this aspect. The findings further aim to be possibly applied to a broader context that deals with behavior change in public places with the help of gamification and highlight important aspects and potential mistakes to be considered. But it has to be noted that these guidelines do not claim that all of them should be used the same way and at the same time. Certainly, their applicability depends on the context, time and place and the people that are addressed. Therefore, they have to be handled as advice but not as the only solution and not all of them might be as helpful in some cases. Referring to the term of 'sustainability', the guidelines are not specifically linked to it and could be applied in other fields. Yet, actions enhancing sustainability are simpler to be advertised and constraints are rather easy to be accepted because of people's general positive attitude towards them.

1. Creating curiosity is a first step to attract people.
In order to draw people's attention one has to generate curiosity and interest (Keller, 1979). This is usually already addressed by introducing new technologies, unexpected events and interventions that make the user reflect (Müller et al., 2010). Both versions of Cup Builder in fact succeeded in making customers of the café curious. Making an installation visually appealing, as we attempted to do, is thereby of advantage (Consolvo et al., 2009; Nakajima and Lehdonvirta, 2013; Fogg, 2002). Nevertheless, the prototype could not attract them for very long. This was due to the fact that information and feedback was too abstract to make sense to the majority of people. The interest of the user being transformed into him actually doing the desired action is therefore an important step to reach with a design. That is why curiosity is only the first step to motivation and has to be combined, for instance, with creating relevance with an identifiable goal (Poulsen et al., 2008).

2. The game should be perceptibly quick, easy and unobtrusive.
As all of our participants stated, the fact that Cup Builder could be played in a very short time and did not require many steps, made it enjoyable. Further, the more elements (such as mini-games and levels in our case) are added, the more one has to consider time and effort they require. Generally, people in public places are there for a certain purpose and most possibly do not have much time to spend on other activities. The game should therefore be unobtrusive as not preventing them from doing what they came for. Additionally, everyone should be enabled to decide whether or not he wants to participate in the game, people should be able to ignore it at certain times to not interrupt their flow of actions (Consolvo et al., 2009). This perception of being in control of the own actions is another factor for increasing people's motivation (Malone and Lepper, 1987). However all these efforts are useless if people do not notice the simplicity of the game. It is, in fact, important to highlight this to make potential users overcome the threshold of participating for the first time.

3. Competition is a key mechanic to increase the motivation to play.
Competition is one major factor that can increase intrinsic motivation (Keller, 1979) by allowing to compare performances and with respect to one common goal. The competition in Cup Builder was represented by the virtual cup of Café C that was displayed on the main screen. All of the participants mentioned that it stimulated them to see who was in the lead and encouraged them to play further to win over the others. On the other hand, competition on an individual level, as highlighted in the final interviews, has to be considered. This is

supported by findings of Gustafsson et al. (2009) which showed that both competition within a team as well between several teams was a motivational factor which led to a decrease in consumption in that case. Furthermore, Malone and Lepper (1987) see competition as an important interpersonal motivation factor. Therefore, the game should encourage competition on different levels which can also establish group dynamics among strangers and the need to collaborate (see Guideline 9).

4. Allowing the user to make elements personal creates attachment.
As it could be seen in the study, the participants demanded more personalization of the tiles which would enable them to recognize them and make the game more meaningful. This feeling of control, in this case created by the choice of how the personal contribution should appear, represents another intrinsic motivation factor as part of Keller's ARCS model (Keller, 1979). Also relating to the factor of recognition (Malone and Lepper, 1987), personalization should be used to allow the user to express himself in an anonymous place, show it to his environment and thereby create a feeling of relatedness (Oulasvirta and Blom, 2008). The actual process of personalization or customization, as could be seen in the study, also makes the game more enjoyable.

5. A balance of positive and negative reinforcement with emphasize on the former is encouraging.
The study showed that the feedback that was provided for the case of having a paper cup was rather making the users feel disappointed and demotivated instead of encouraging them to rethink their choice for the next time. People could be observed who approached the main screen several times, trying to play the game with a paper cup but were rejected. This was very badly perceived and, combined with the actual intended negative reinforcement that is damaging the tile, made the punishment even stronger and overweight compared to the positive reinforcement. This has to be counterbalanced by favoring the rewards. In the case of Cup Builder this could mean, giving all customers the chance to play but reward the ones using reusable cups by allowing them to play even more. Another way would be to access to two versions of the game depending on the choice of cup, enabling the one taking a paper cup to make up for their 'bad' behavior. This general problematic is one important point where guidelines by Consolvo et al. (2009) and Nakajima and Lehdonvirta (2013) do not agree, as explained in section 3.6. Our advice is to, generally, rather use positive than negative stimuli, and otherwise to consider their balance in favor of the reward to not make the punishment too severe. This should be applied in most situations but especially in public places since people want to perform well in front of the others (Goffman, 1959) and therefore could feel too ashamed in case they do not, which would lead to a total disinterest towards the game.

6. Meaningful and immediate feedback is a support for the user.
Feedback is an essential part of any game (McGonigal, 2011) and other interventions that enable active participation. It tells the user about the status, occurrent events or actions that have been performed. It is especially true in public places where people need to know their own impact right away otherwise they cannot make the connection. Also it is important to make the feedback easy to perceive since it is supposed to support the user instead of forcing him to spend time and effort on understanding it. This issue could be seen with Cup Builder when the participants claimed the feedback given on the tablet was not clear enough to help them understand their action. Therefore, user tests without the intervention of the moderator have to be conducted to observe if the feedback is intuitive. Providing the information also has to happen at an appropriate time and location (Fogg, 2002). On this aspect, the use of the

tablet was very adapted, since the impact of the choice was directly connected to the action of taking coffee.

7. Information should be visualized in an understandable way.
Visualizing data is an extensive area which should be part of the research when designing for behavior change with gamification. The users can only relate to what they see, when it is rather precise than abstract information. Adding actual numbers along with the possibility to compare performances helps to make this information more meaningful. Concerning this aspect, Cup Builder failed in visualizing the consumption in a way that it was easy to grasp. On the contrary, people did not understand what the different tiles represent, especially the ones who did not spend much time with it. This time factor is another issue related to the visualization, meaning that people should not be forced to spend much time with trying to comprehend it. All these aspects have to be considered in public places in order to reach even people passing by. Complex and lengthy instructions, which the ones used on the info sheets could be considered as, are therefore not appropriate. On this aspect, it seems that we have a different approach than Consolvo et al. (2009), whose advice is to prefer metaphors. However it is opposed to raw data, which means that there should be some filter to make it understandable to the users. As a conclusion, the degree of preciseness versus abstractness should be adapted to the target group so they can easily understand it and perceive the evolution so they can relate to and change accordingly.

8. Consider the different stages of behavior change to address the crowd.
As there are many different kinds of people in a public place, their behaviors and attitude to behaviors differ likewise. In order to address the majority of them the different stages of behavior change, as explained in the Transtheoretical Model developed by Prochaska and DiClemente (Glanz and Rimer, 2005), have to be considered. In the lowest stage people have no intention to change and therefore, firstly, have to be made aware of the need to change. As for Cup Builder, it succeeded in making people aware of the environment issue related to the cups, simply by providing visualizations that encouraged to reflect upon. Further, people that are already aware but have not taken any action yet, have to be motivated. Several motivation factors have been addressed with the game prototype, as highlighted in other guidelines. Yet, this motivation should, first and foremost, be targeted to be intrinsic rather than extrinsic, to make sure the motivation is kept up over a long time. On a higher level, feedback and reinforcement are needed to support behavior change for those who have already taken actions. That is why appropriate and meaningful feedback (see Guideline 6) and a balance between positive and negative reinforcement (see Guideline 5) is essential in order to achieve enduring behavior change.

9. Both the individual and the group should be considered.
Although not directly stated by the participants as a necessary game element, triggering collaboration among the familiar strangers described by Paulos and Goodman (2014) is important when it comes to changing a general behavior in a public place. Having one main goal that can only be reached when everyone works together is an effective intrinsic motivation factor (Malone and Lepper, 1987). Filling the virtual cup in Cup Builder represented the collective goal whilst every individual was enabled to show their personal contribution. This possibility to show off was one of the requirements elicited already after the focus group. Thus, along with collaboration, recognition on an individual plays an important role when motivating people. As mentioned in the guidelines by Huber and Hilty (2015), the user should be seen as an individual with individual goals but at the same time as part of the society. In general, people tend to have the aim to perform well in front of others

since they want to give a certain impression on them (Malone and Lepper, 1987). The study revealed that this was also one important aspect of Cup Builder which allowed the users to recognize their own and other people's contribution on the main screen.

10. Take the need for the individual's privacy into account.
Playing the game should not be a way to collect private and non-anonymous data about the users, or at least they should be aware of what is done with and who has access to it. Participants of our study did not bother too much about it when playing with the prototype because it was obvious that there was no mean to track them personally. However, as soon as we mentioned a personal cup that would act like an identification tag, the problem of collecting data and connecting them to an individual was raised. On a larger level, the data should be displayed so people do not perceive it as an intrusion and are not ashamed of making it public. This is supported by Consolvo et al.'s guidelines (2009), which also mention the need of having a history to see the evolution of the data. Combining both in a public place is a challenge that could be solved by making personal data only recognizable by the owner.

7 Discussion

This chapter will discuss several issues that appeared during the thesis. Firstly, it will deal with a discussion about the methods that were used, followed by the different results of the thesis. An attempt to generalize the findings has been made and will be looked at further here. Lastly, some issues concerning future work will be addressed.

7.1 Methodology

The design process made use of various Interaction Design methods that will be discussed in the following.

7.1.1 General approach

In general, we strived to apply an iterative approach with high user involvement, and the latter turned out to be very valuable for us. Only by interviewing users of the library, for instance, revealed that the sustainability issues we imagined there were not existing. The focus group was a great inspiration from which elements emerged that became an essential part of our concept, such as having a public metaphor or the competition against another café. Together with the feedback from user tests with the low-fidelity prototype it also highlighted the importance of personalization in the game. Lastly, with the user study we got even more qualitative feedback which served as a base for the guidelines. Throughout the process we had quite some iterations regarding our concept which was discussed and adapted lengthily. It was planned to also have several iterations with the prototypes, but in the end we focused much more on the concept development and then only had time to do one low-fidelity version before implementing the prototype for the study. But since the concept behind was of a wider scope than the actual interactions with the prototype this shift seemed appropriate. Nevertheless, it would have been good to test the high-fidelity version more before the user field study and resulting from this have more iterations at that stage.

Blog writing, as suggested by one of our supervisors, was one method that we had planned to use throughout the whole process but dismissed after some weeks. The reason was that we were not very consistent and would have had to work off what we missed several times, which seemed not worth the time. We also constantly took notes at other places, so it seemed redundant to write them down again. Yet, in retrospect, it would have helped us to keep track of all the interim results and decisions we made and to collect them at one place. Furthermore, constant reflections while summarizing the recent developments, would have been a good way to highlight the strong and weak points of our project already in an early stage.

7.1.2 Focus group

The focus group in the beginning of the ideation process helped to get started with brainstorming and some good thoughts about what would be important for the game concept. It was, in fact, planned to use the method of bodystorming in this group discussion, as we imagined trying out and experiencing different roles would help to come up with issues in the context where the prototype would be introduced. Shortly before the focus group, we decided to not use this method due to doubts about whether or not our participants would feel ashamed to actually play which would restrict them in their creativity. Since, in the end, we did not try out bodystorming we do not know what would have happened. Moreover, the fact that we had only interaction designers as participant might have caused a bias to the ideation but we saw it as more appropriate at this stage of the process to ask people that are used to methods like this

and that have a critical thinking about design issues. The number of five was also suitable for one session, and the various characters and past experience of the participants gave a good balance where everyone was able to express their thoughts. One participant turned out to have worked for one of the campus cafés, Café Bulten, sometime which gave us good insight into the café's policy and their attitude towards the coffee cup issue. Finally, we had a lively discussion from different perspectives and are satisfied with the outcome, even though conducting several sessions would have provided us with even more ideas. Yet, due to time issues we were not able to realize more than one focus group.

7.1.3 User Field Study

In all three weeks of the user study, measurements were carried out that would help to compare the consumption before and after the introduction of the prototype. Nevertheless, those numbers did not represent the actual consumption of cups since it was based on people pressing a button on a tablet to register their choice and cannot seen as very valid data. Undoubtedly, this led to a lower number of paper cups and reusable cups than really consumed, assuming that only a part of the customers used the tablet. Yet, these numbers, especially within the reference week, helped to balance the game, in regards of how many tiles the virtual cup should contain and how much value a paper cup should have when damaging a tile. It also gave us an idea of how many people would actually be willing to participate in the game. On the other hand, having more quantitative data would have been advantageous in order to draw conclusions about whether or not the overall consumption had changed during the three weeks. The rough numbers we got from the attempt to count all paper cups during a day in the beginning and in the end of the study just allowed us to estimate the development of the consumption.

The position of the tablet during the user study was decided to be next to the coffee machine, so the interaction by the user would happen after his choice of cup. It could be considered to introduce this part of the prototype at a different place so people would first interact with it and from there take their decision which cup to use. This would reach the people at a different stage and make them aware of the impact of their choice beforehand. Nevertheless, with this setup our concept would not have worked the same way and would have required adaptations.

7.1.4 Participants and final interviews

Originally, we had planned to have at least five participants for our user study, who would use our prototype during the two weeks and who we could interview afterwards. Unfortunately, it turned out to be very difficult to get hold of people who were willing to do this and even more, half of the ones who agreed in the beginning backed out before the end of the study. But we found two other customers of the café who took notice of Cup Builder and approached us so we were able to interview them. One of them had not seen visited the café in the week of the Visualization but since we went through the two versions of the prototype during the interview he could make up for that and gave very valuable feedback.

The two paired interviews were very different in terms of the character of the participants and the general flow. The first interview was conducted with two friends who were generally not talkative and enthusiastic, which made us, the interviewers, ask them more and more. This might have overcharged them slightly and therefore did not necessarily encourage them to talk more open. The second interview, even though the participants did not know each other, went much more fluent and needed less interventions from the interviewers and if so rather to keep the participants to the point. Here both participants came up with ideas themselves because they were interested in the topic which is probably also a reason for them

approaching us in the first place. One could even refer back to the theory of motivation which implies that the participants who got extrinsic rewards in form of free coffees were less motivated than the two participants who came voluntarily and were rather intrinsically motivated to participate.

In the end of the interviews, the participants were asked about potential further improvements of the game by telling them about the different other game elements that were part of the theoretical concept. Some of them then had difficulties imagining how those elements would be applied to the existing prototype and what effects it would have. This showed that actually experiencing features like using the own cup to show one's personal contribution or mini-games and levels would have been more valuable in regards of finding out if these elements would add something to the game and could enhance people's motivation.

7.2 Results

Both kinds of results, the prototype as well as the guidelines, are included in the following part of the discussion.

7.2.1 **Prototype**

The results of the user study clearly showed that more precise feedback and information about what is visualized would be needed in order to make Cup Builder more meaningful to the customers. This also showed that the Visualization as a standalone was not sufficient enough since it rather represented a still version of the Game, which is due to the fact that the Game had been the focus of the concept development. The level of abstractness of the visualization made it more difficult for the customers to grasp the information we wanted to convey also because they were simply not used to this rather novel way of visualizing the consumption. Learning and understanding the visualization was therefore a major part of our concept that we had not really considered in the beginning and which influenced the outcome of the study. But Information Visualization is an extensive topic and it would have required much more time to investigate the best way to visualize the consumptions of cups for this context. Moreover, as part of our study it was also necessary to have the same basis for both versions of the prototype. Either way, having the possibility to compare these two versions helped the participants in the interviews to highlight the flaws and strengths of the concept. The graphical design, on the other hand, was in general really appreciated. The guests of the café could easily relate to and were attracted by it because of the pixel style of the game. We imagined that our target group of students from mainly the IT department as well as Electronics and Computer Science are people that can be considered as having a favorable attitude towards games. Besides, the simplistic look without any obtrusive frills also helped to detect what is the focus of the prototype.

One weak point of our game concept was the fact that only people using a reusable cup could play the game whilst having a paper cup would not allow them to really participate at all. As we saw from the short interviews with customers and from observations during the study, this often led to disappointment and frustration and probably even discouraged some people to register the choice of cup on the tablet at all. One of the original ideas to let everyone play the game but at different degrees according to their cup would have probably solved this issue. After the user test with the first version of the prototype, we attempted to change the feedback for taking a paper cup to be less discouraging which was required by several users, but which we apparently did not succeed with. Although we first linked this to the vocabulary used in the message, this disappointment seems to be rather related to the impossibility to play. On

the other hand, the negative reinforcement of damaging the tiles did not seem to support this phenomenon. Apart from being not very encouraging the feedback in text messages on the tablet was not very clear. Even when allowing a person with a reusable cup to play, the message did not tell him anything about what the game would be about, only that he would have to go to the main screen to play. Although, several people were curious enough to check this out, the majority did not even have a look at what the game would be. This might have also been caused by the fact that our concept was designed with two separate screens that the user would have to interact with both.

In general, it was a good decision that the implementation only focused on the basic concept and the most important features. This allowed us to test a fully functioning prototype and to observe the different interactions and reactions of the customers without having to intervene too much. On the other hand, having a workaround for the detection of the kind of cups introduced some kind of bias meaning that people themselves could decide whether or not they registered their cup. Followed by this, only people who pressed a button on the tablet received direct feedback, whilst the others would not see any changes directly related to their actions. This also modifies the order in which guests are supposed to apprehend the game: their attention is already caught when pressing the button and they look for a feedback instead of being attracted by an animation caused by the detection of their cup. Other algorithm choices could also be discussed regarding their pertinence. This includes, for example, the decision of adding a tile when the play mode is triggered but when the player has not interacted with the game for a while. A few players actually started the game before reading the explanations which then took them quite long and therefore made them miss the opportunity to play further. Even if in the end it did not have a very big impact on the study, it might have been better to just cancel the game and simply return to the default screen with a pop-up text explaining that the time is over, but the game could be restarted.

7.2.2 **Guidelines**

The guidelines were formulated in the very end and were not always consciously considered while designing the prototype even though the elicited requirements after the focus group could already be seen as a first version of guidelines. Yet, they rather represent a summary of what we learned with this thesis including mistakes that we made and were not formulated iteratively because of time issues. Basically, the guidelines were created by noting all important aspects we found during the user study combined with the requirements and then filtering them. They were also chosen considering whether or not we could support them with findings from both the study and the literature. Still, having the well-defined guidelines already in an earlier stage, before the implementation, could have helped to avoid some flaws of our prototype such as the kind of visualization and the need for more precise feedback.

7.3 Generalization

The research area of this thesis was in the end quite narrow and we investigated a very specific issue with the coffee cup consumption in a café. This implies that there might be some difficulties applying the findings to a broader context as intended with the guidelines. Since we address only one specific action, namely the choice of cups, the transferability to another situation might not be fully given. Considering the consumption of electricity, for instance, involves many different possible actions people can perform to consume less. Conveying those possibly requires more effort and a different kind of focus, also because this matter cannot be visualized and grasped the same way as the tangible cups. Therefore, we suggest that the game to be designed is highly dependent on the context, the issue it addresses

as well as the people it aims to engage. For the latter, we also had a quite specific target group of students with an engineering background, and the study would certainly not have given the same results when targeting a different group of people. Furthermore, in another environment, not only the kind of technology that is appropriate might differ but also the character of the game, its level of seriousness and lastly the time span in which it should be played. That is why our guidelines are possibly not all relevant for every context and have to be used with care.

7.4 Future work

An essential possible improvement for Cup Builder if it would be developed further, would be a stronger focus on the element of personalization, giving more precise feedback and creating a more distinct visualization of the consumption. This emerged from the final interviews held after the study.

Since behavior change happens over time we were not able to investigate the impact of our prototype in terms of how and if people would change their use of coffee cups. One interesting aspect for future work would therefore be to conduct a study over a longer period of time and to see whether after removing the intervention the behavior would fall back to its original state or if people would keep it.

One interesting finding of the study was that, in the end, our game did not only serve to motivate people to rethink their choice of cup but also turned out to inform about this choice. Both the short interviews at the cafés in the beginning and the final interview showed that not everyone was actually aware of the possibility to choose between paper and ceramic cup or to even bring an own reusable cup. This aspect of teaching people about different actions to increase sustainability would be interesting to look into further. Giving more precise information about what effect people's behavior would have on the environment, could also help to increase their interest. With this it would also have to be investigated what it takes people to learn new facts and behaviors. This probably also played an important role considering the abstractness of the visualization in Cup Builder, which required people to learn about what it represents. And this obviously takes more or less time depending on each individual. Time, as highlighted by Nakajima and Lehdonvirta (2013), and especially the duration of the study, is an important factor to consider when designing for behavior change.

Lastly, the thesis was done considering Café Linsen, where the study was conducted, as one stakeholder. This implies that feedback from the staff at the café as well as from its owner would be of interest to get an understanding how they perceived the introduction of Cup Builder. The question could be answered whether there is a value for the café to make people change their behavior regarding the choice of cups and if they could imagine possible long term effects that would encourage them to add a comparable intervention to their business model.

8 Ethical issues

Persuasion and behavior change are fields that by themselves already raise ethical questions, but adding to them the layers of technology and gamification develops them further. In the best case, such methods encourage people to perform actions that are better for themselves or for the environment, but these good intentions might be perverted. The following presents some of these ethical issues that might occur and have to be considered during our study.

The biggest problem is when the influence of persuasion on people is intentionally misused. Building a system that would make people adapt to a behavior that serves a company's purposes at the expense of the person's interest is of course reprehensible. If people completely trust the system without questioning it, they can be easily controlled and manipulated. This is especially problematic "when used in the fields of politics and marketing" (Nakajima and Lehdonvirta, 2013, p. 123). Even though, this aspect was not considered to be a serious issue by our participants, one cannot neglect the fact that an intervention like Cup Builder might benefit the café where it is introduced.

It is possible that the methods used to reach the planned outcome either induce side effects or miss their goal. In that case, we speak of unintended outcome (Fogg, 2002). One specific example of it in our case is the coffee consumption indirectly addressed with our prototype. Cup Builder aimed to decrease people's consumption of paper cups independently from their actual coffee consumption. Yet, as we could see with one participant, it motivated him to drink even more coffee, even though in a reusable cup. Therefore, preventing people from perverting the actual goal of an intervention has to be carefully considered when designing in this context. This problematic raises also the question of responsibility when technology is involved: is it the system's or the designer's fault when the real purpose fails to be conveyed and an unintended behavior is triggered?

One strength of persuasive technology is that it is supposed to intervene at the right moment. However, there might be situations when people get addressed when they are not ready, which would reduce the efficiency and annoy the individuals. In the worst case an intervention happens even obtrusive and prevents people from accomplishing their tasks. In the general context of our study, many people spend coffee or lunch breaks at the café which might imply a rather relaxed mood. Yet, as we found out, a lot of the customers are working and studying at the café and claimed they would not want to spend much time on playing a game. Introducing a game at different contexts therefore has to be done in a way that people can decide whether or not to get involved, and it has to be unobtrusive (see Guideline 2).

Finally, our prototype as several other projects in that area include handling personal data. In general, monitoring and measuring personal data with sensors has to be dealt with carefully. On the one hand, knowing that one is being monitored might have an influence on the actions and behavior, on the other hand, people might want to be aware of these observations so they could decide to avoid them. The concept of Cup Builder originally is based on an automated detection of the kind of cup people use without asking in advance for each person's permission. The actual implementation of the prototype, bypassed this potential issue of privacy, since every person could decide whether or not to press the according button. But it stays an important aspect that some people might not want to share as much information as others especially when focusing on public places (see Guideline 10).

9 Conclusion

Gamification and sustainability have already been studied together but looking at these two aspects in the context of a public place can be seen as quite novel. The research questions defined within this scope and that were strived to be answered with this thesis were:

In the context of a public place, how can gamification be designed in order to influence people's behavior towards sustainability?

And more specifically we defined a context and behavior to investigate, which leads to a driving question: **Can the addition of game elements to a visualization make students use less disposable cups at campus cafés?**

This second question was aimed to be answered with the help of a prototype and a user field study which would give us valuable knowledge and allow us to generalize the findings to provide relevant insights to answer the first question.

Within the frame of this thesis, a prototype of a game - Cup Builder - was deployed to be tested in a campus café. In order to find out about the influence of the addition of game elements, two versions were implemented, the Visualization and the Game. The main concept is based on the layout of a virtual cup, which is influenced by the customer's cup consumption: using a reusable cup enables adding a tile, and therefore contributing to the building of a structure that fills up this cup. In contrast, taking a paper cup damages part of a tile. In order to analyze the effects of the addition of game elements on people, two versions of the prototype were implemented. The Visualization automatically adds the tiles, whose position and color are randomly elected among the possible choices, or damages one depending on the customer's choice of cup. The Game, on the other hand, includes the element of personalization which enables users of reusable cups to customize and place their tile onto the structure by themselves. Collaboration among all customers as well as competition against another café are further game elements added to this version. These different mechanics emerged from research of design frameworks, as well as interviews, observations and a focus group that were conducted as part of the project.

A user field study was conducted during three weeks at Café Linsen at Chalmers University of Technology, the first week serving as reference while the last two were dedicated to test the prototype. Observations and short interviews were carried out to understand the general impression on customers. Besides, participants were recruited in order to collect deeper information and feedback with interviews at the end of the study. Questions were also asked to them about features of the game that were not implemented.

Several interesting findings appeared from the whole process. In general, the concept of the game was appreciated by the ones who understood it and many customers were willing to interact with the prototype during the study. However, Cup Builder failed in conveying its purpose to most people who were unaware of the goal of the game and required more precise feedback. For those, the short time they spend on buying a coffee and the kind of information the prototype provided was not sufficient to draw their attention. Whilst the aim was to encourage a rethinking of the choice of cup with the prototype it also turned out that it served as means of informing people about the possible choice and therefore could be seen as a first step towards behavior change. The Game version also presented the advantage to be more involving and therefore more interesting and fun than the Visualization. It made people care

more about the status of the virtual cup and increased their motivation to change their behavior. This relies at different levels on the mechanics and the interactions that were part of the game concept. The results showed that elements such as the introduced collaboration, competition and personalization compared to the sole visualization could indeed support people's motivation to use less paper cups in the investigated context. So the driving research question can be answered with a conditional yes. This means the outcome was promising but the problematic would have to be investigated on the long run and with more valid data, and the results only apply to our specific case. In order to transfer the findings of this thesis to other situations, a set of guidelines was finally formulated:

1. **Creating curiosity is a first step to attract people.**
2. **The game should be perceptibly quick, easy and unobtrusive.**
3. **Competition is a key mechanic to increase the motivation to play.**
4. **Allowing the user to make elements personal creates attachment.**
5. **A balance of positive and negative reinforcement with emphasize on the former is encouraging.**
6. **Meaningful and immediate feedback is a support for the user.**
7. **Information should be visualized in an understandable way.**
8. **Consider the different stages of behavior change to address the crowd.**
9. **Both the individual and the group should be considered.**
10. **Take the need for the individual's privacy into account.**

Those guidelines are intended to attempt a generalization of the results. Regarding the initial critical approach towards gamification, this concept is applicable in the context of behavior change towards sustainability. But in order to succeed in public places, it has to follow some more strict advice than in other environments. This is what the guidelines strive to provide. Besides, they are imagined to support other designers and researchers investigating a similar area with the possibility to be developed further.

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11 Appendices

11.1 Appendix A: Interviews at library

Questions

Students
What problems/problematic behavior related to sustainability do you know of in this library? (imaginary, or experienced yourself)
What behavior of others annoys you personally?
What do you expect from other people to do or not do here?
Do you, in your opinion, contribute to a sustainable environment here in the library? How?
Do you think more about energy consumption at home than here? why?

Employees
What problems/problematic behavior related to sustainability do you know of in this library? (imaginary, or experienced yourself)
What do you expect from people to do or not do here?
Do you have the impression that the students in the library care about the environment here? why?

11.2 Appendix B: Interviews at cafés

who: waiters, customers
where: bibliotekscaféet, Bulten, Pripps, Linsen
when: Friday morning/afternoon
aim: what's the current situation (both points of view)?
find out what is important to take into account during the study in order to not break/change the flow

Questions

Waiters
Describe the process to get coffee: Why is it like that here?
What are your tasks when someone buys coffee?
Is it possible to bring your own mugs? Do people do this?
Do you have reusable mugs that people can use? Where are they allowed to use them?
Are there any problematics with these reusable cups?
How often are these taken by the customers?
Do you have any numbers of how many paper cups are used?

Customers
How often do you visit this café?
What do you usually buy?
Do you stay here to eat/drink?
What kind of cup do you take?
Do you know that you can bring your own mug?

Would you consider bringing your own mug? why (not)?
What would motivate you to not use a paper cup?

11.3 Appendix C: Transcript of focus group

Introduction….

H: First of all, have you been to any of the cafes at Johanneberg, since we focus on that campus because there are several others like Linsen and Cafe Bulten? We have some pictures… Even if it's not at these cafes, you can purchase coffee at other places. Do you do that and what kind of cups do you usually use then? Or do you think about that aspect at all?

N: I usually take the paper cup when I'm going somewhere and I try to take the other cups when I'm staying there. But sometimes I think I'm going somewhere and it turns out I'm not. And I end up with the paper cup sitting at the table.

K: Yeah the safe choice is always the paper cup because you can sit there with it but also go away, so

N: You don't have to decide when you get the coffee.

K: Yeah exactly, you never know with your friends. So instead of having this, you sit here and you sit here you can just grab a paper cup.

A: Especially with them (pointing at photos), because then you're buying the coffee in your break and go with it to your class room again. I never bought coffee in a glass or a mug.

H: At this cafe (pointing at Bulten), they have this ceramic mugs but you are only allowed to use them in the cafe because they sometimes had the issues that people don't return them of course. So you're kind of forced when you take away to take the paper cups.

M: But you can have your reusable though.

H: Yeah you can use your own cause then they don't care. But I think many people don't really know that.

N: Yeah and then you have to bring them in your bag.

A: And it takes a lot of space in your bag, especially when you bring your computer.

N: And if it's used you are afraid that it will be messy.

K: And then you never rinse it properly either.

My: Do you know that at some cafes it's cheaper when you refill your cup, your paper cup.

K: Oh.

My: For example at the chemistry building, Cafe Hedvalls, it's cheaper.

N: So you get a discount… But what about the stationary cup, or what do you call it, porcelain mug whatever. Do you get that same discount.

My: No because they don't have porcelain anymore.

N: Oh they don't have that.

My: Yeah at that cafe they don't have it anymore because it got stolen.

A: And when you bring your own porcelain?

N: Would you have the same discount then?

My: There no, I don't think so.

H: Not sure, even though they have the same owner, Chalmers Konferens, they have so many different policies.

N: Cause I think it would be a good idea, we pay for a paper cup, we pay like an extra crown or whatever and if you bring your own you get the same discount as if you didn't take the paper cup.

K: Yeah exactly, cause in Bulten, I had the economy post in the board, so we discussed this a lot. We also initiated the competition for the design of the… there's a really talented guy who did the design. So we really wanted people to use the porcelain mugs because that's much cheaper. If they do not get stolen at least. *laughter* Also it's a problem with the lids, though in Bulten you never get the lid first, you got to choose it afterwards. And that's because the lid costs almost as much as the mug. And most people just take it off anyway, to let it cool. So then it's a waste.

H: I think it's just some automatic thing. Ok so here's the paper cup and the lid is next to it so you take it.

N: Exactly, but if you have to ask for it there is a small obstacle there. And you might choose not to.

K: Now they are hidden behind the…

N: We did the same thing at Systembolaget with those safety nets you put over the bottles. They cost like 1kr each

K: Oh wow.

N: Yeah so know we put them behind the counter and everyone has to ask for them. That lowers the consummation of it.

A: That's like in Roskilde they have this pant, it's like 20 kr and so you want to recycle it. And also it's great when you don't recycle it, someone else can make money of it.

N: And everyone wants to pick them up.

A: So that wouldn't solve the bring your own cup issue but maybe you could have that on the porcelian mugs as well so you get it back. … Or maybe people would go to IKEA and buy …

N: I wouldn't…. if I had the choice of a porcelain mug and I have to pay 20kr just to get out I wouldn't do that.

A: But maybe you could do something. Maybe not that you have to pay for but you have to recycle it

N: I like the idea… to make you think that this is not for free.

K: Also the main benefit in Bulten to choose the porcelain mug was that you can refill it

N: That's a good…

K: Yeah and that's almost behavior…

M: What about the paper cup?

N: .. it's not allowed.

K: It's not that someone guards the coffee. But you would feel like reluctant to it.

A: It doesn't feel ok to take a refill.

M: Really? You guys are so Swedish! *laughter*

A: I actually sometimes go to Ls to get coffee without actually…

N: Yes, without paying.

A: It's because we're eating lunch there so often.

K: There's also an interesting solution that happened to us. Because the glue was so bad at a badge when they had a new design so everyone was complaining like crazy and then all the porcelain mugs were out because everyone used them. So that worked really well because we're kinda meticulous about the temperature. It's supposed to be 94 degrees, so it's really hot in Bulten in the beginning.

A: That's the best coffee at Johanneberg.

K: And then it kinda destroyed the glue in the cup. It dissolved.

N: *laughing* That's a good idea to solve ...

K: Yeah because then everyone used the porcelain mugs and took their time to sit in the cafe.

N: The coffee is better in a porcelain cup.

My: That's actually something we heard during the interviews in Bulten. People were saying it tastes better.

N: Yeah it gets a small taste of paper in the paper cups.

A: It's about the experience while drinking.

H: There are actually many people who stay at the cafe or close by to study and they are there for the whole day. And then they rather think about… Ok maybe I get more than one coffee at the same place. So why not use a reusable mug.

A: We are lazy.

K: But that could also be interesting cause usually when you sit at a cafe, I know this is more common in America. If you don't buy anything they will ask you to leave because you occupy space. So it's nicer to have the cup to show that you have purchased something. If you have a paper cup then you can have the waiter coming and just throwing it away but with the other mug it's different I think.

My: You talked a lot about the lid. But what if there was a lid on the mugs, would it change anything?

K: I wouldn't like it.

N: I never use the lid but that's personal I suppose.

M: How would you put a lid on a porcelain mug?

H: But if you rather have one like this (pointing at KeepCup).

A: Yeah I have one like this.

H: Paper cup is easier because you also have a lid, it maybe keeps it warmer and doesn't leak.

N: yeah in the winter time I use the lid, that's true.

My: Cause someone mentioned people just put it away and let it cool. So it's just something for transporting it. So it could be the same thing with a mug, you have a lid so you can move with the cup.

N: But wouldn't people run away with the mugs more often?

L: Yeah that's what I think. If they say that they think they can keep that.

N: I'm not sure.

H: What if we make people have their own mug but give them a way that they don't have to carry them all the way home and they can somehow deposit it.

N: Yeah you can have a deposit for the lid, like you said.

M: But Starbucks had this. There was a cup that they had an edition for a while.

N: Ah right for take away.

M: So with that cup it was cheaper for you to buy coffee when you had that cup. So you just had to present it. That's the same with this thing (pointing at KeepCup). It's just that this cup is so bad, you cannot actually close it enough so you could put it in a bag without the feeling that it would leak. While the Starbucks cup was really good, it was so tight that you could put the cup in your bag with coffee inside and it wouldn't leak. I think that's the biggest disadvantage for this one. I would never put it in my bag with coffee inside.

My: But you don't put your paper cup either. *laughter*

M: No that's because I drink it and then I throw it before.

A: But it would be nice to be able to put it in a bag, cause maybe you have to run for the bus.

M: It's also when there is left over coffee you don't want it to spill in your bag right, because it's an issue I have with that cup. My bag started smelling like coffee.

A: And that's something positive with the reusable mugs if you would be able to… then people would be more willing to.

N: Cause that would make it even better than the paper one.

A: Exactly, and the porcelain mug as well.

K: Because everyone know it's such a hassle to open the doors here. It would be nice to just tuck the cup under your arm and you could use both hands. That would be awesome.

A: Or magnets that you could just put…

N: Magnets on the cup and then you could put the keys on the cup

H: The cup is actually the chip.

N: That would increase the value of the cup.

K: I have a huge problems with lids. ...hahaha… When you drink from it and the coffee is really hot the small hole gets super hot.

N: Yes definitely, so you burn your tongue.

K: And then it's a waste of coffee. So that's what I don't like about it.

A: It's a surprise every time.

My: Also talking about the heat. Some people take two paper cups because it's too hot. With tea for example.

N: I would just never do that.

A: The colorful cups that they had, they were awesome because they had the little dots. But they were so beautiful so I stopped using my porcelain mug *laughter* I was picking a color every time.

N: And they were nice to hold, with the texture.

A: I think many people started to use them.

M: You should have pictures of landfills all around them.

N: Yeah ugly paper cups.

M: Dead animals… That would work actually.

A: Or like you're a bad person.

N: Or do you know the rain forest is… Like warning labels on cigarette packages.

K: Like a picture of the forest that was deforested.

N: So, this took one tree.

M: This cup killed a seal. A baby seal.

H: So know we've talked a lot about the cups. And we know it's difficult to change all these things. We can't introduce a bunch of totally new cups. So we rather focus on the thing around, making something around it so that people would rethink their choice. We have the choice here between two or three kinds, we don't introduce a new one and there is disadvantages for this kind and for that. But still I think the porcelain mug is the environmental friendliest one. So we would rather make people use them. And coming back to the game we want to introduce maybe let's start thinking about game elements we could add to the process of buying a coffee. To the mug, or to the counter or to the coffee machine itself.

My: It can be anywhere, on the ground, on the ceiling, on the walls, on screens.

N: But maybe you just have to put it a bit further away. You hide it or you just have to walk a little longer. Because time is very important for everyone. So if you have to walk a longer way to get a paper cup, perhaps fewer people would. I mean that's gamification if you think about it in the long run, kind of.

A: I have one idea. If you're thinking we are collecting a lot of data, what if our data is collected, about me when I pick the porcelain mug or a refill. And then if I go into the cafe and there is a big display and there is a highscore list of people that are in the cafe. And then

you could see how is the most environmental friendly. So I get my ten seconds in fame… At least if I buy coffee in a porcelain mug.

M: Don't you think that's just making you go for consumerism. Cause then you need to drink a lot of coffee to be on the top.

N: But it could be an average.

A: It's just a percentage… Maybe it's not realistic but I think it would be cool.

K: But maybe you can use paper cups if you reuse them. I'm thinking if you have a QR code printed on it, so you know it's this mug and if you use it on several machines then you get like a discount or something.

N: More and more for each use.

M: But it's still not as good as using the porcelain mugs though.

K: I think so, because the porcelain mug, you have to dish it.

M: Why did you pick that one (pointing at Ks paper cup)?

K: I actually picked that one because I came from the automat and then I saved this one, so I didn't pick one there (at our counter). I brought mine.

M: Why did you pick that one (pointing at As paper cup)?

A: Actually I looked for the porcelain mugs but since I know that people are really bad…

N: It's different at a coffee shop.

A: At least I never wash my cup, my personal cup and that's ok. But I don't want to share….. But that's a good question, because I made a project about this some years ago. And the porcelain mugs you have to reuse quite many times, between 50 and 100 times before it gets more environmental friendly than a paper cup. But still it's much cheaper for the cafes to buy that for 2 kr. So if it's about to be more environmental friendly maybe that's (paper cup) the best idea but it's still much more expensive.

My: Yes we are aware of that.

A: Because at bars, glasses break all the time, so then it would maybe more environmental friendly but it tastes nicer in glasses.

H: Also you have to think about the manufacturing of these kind and these kind. We can't really say that this is really worse than that.

M: It also depends on how you dispose the paper cups. It's a huge difference whether you recycle it or not.

H: We actually found that it's not either you take that or that. But as you said now, you reused your paper cup. That you take a paper cup and reuse it that makes it better than you taking five coffees and taking five new cups. Also if you don't return that kind of mug, that's not really good either. And if you throw a paper cup somewhere it's even worse than if you throw it at the right place and then they can recycle it.

My: So the whole behavior itself is not black or white. It's very different levels.

M: But would it really be best for you to have your own cup, like that kind of reusable cup. Wouldn't it in the end be the best option of the three?

H: The question now is how can you motivate people to…

M: Make an awesome cup!

K: I also think there is an interesting thing happening. We swapped the mugs later, now there is Höganäs, it's kind of expensive. Before that we had Ikea and people stopped using cups and we were pretty surprised about that because wow we got the nice porcelain cups. And then we realized what people do is that when they are new to the cafe, they don't talk to the, or they don't know the people who work there. And then they go for the (paper) cups, because it's a safe choice, they know how a cup works. But a mug, especially a designer mug, people don't really know where are they, can I stack them. People feel like they knock down the row because they are not really stackable. So they are kind of doing it because it's safe… Untested, but we thought it was that. But after a while people got used to it and really like them.

A: So it's important that people should feel safe about picking…

N: I'm thinking maybe the game shouldn't be about which cup to take but instead about which cup you return. If you return a porcelain mug you could get some points and if you recycle that one (paper) you could get points also. And if you just throw it away you get zero points. I think that would be easier.

L: You could have in the cafe, some steps drawn on the floor where you go to the bin. Or at the machine it goes to the porcelain cups.

K: But you're thinking separate lines or?

L: Or you only have one green to the porcelain cup and if you choose the paper cups you have to walk out of the steps. So it's your choice then.

K: To make it more clear.

H: Would you like to have your points or your score displayed somewhere to be seen by everyone so they can be encouraged?

M: There is different cafes right. So you could compete between the cafes, it doesn't have to be an individual thing. So if only you would have a thing like if you put this cup back to its place it would raise the overall score of that cafe. It could make you go for the loyalty of that

one. And if it's worth more points for you to return the porcelain one than for you to return the paper one then it would make you choose more often that one. Like look my cafe is winning, the one I go to every time.

H: So you as an individual can influence the overall score.

M: You know, think Harry Potter style.

N: I would prefer to get a discount instead of points because for me points, yeah ok, I wouldn't perhaps go there as often so it would matter.

M: But what if the price of the coffee goes down the more points the cafe has.

N: I would prefer that and that doesn't mean that they have to lose money, they could raise the initial price.

A: Exactly. How to make people care about the points. Maybe I would like to get a discount, if I would get a discount then I would care about the points.

N: And maybe when you reach 100 points you get a cookie.

A: Oh you get a small cookie if you…

N: Well done it would say with a little sign.

A: Or a sticker.

My: Talking about that how would you make the people that go only once to the cafe be interested in that?

M: You give them cookies.

N: You could have a drive for the first months saying that this is something we're trying out right now. That would be a good idea to get everyone's attention towards what they are doing.

H: So you rather think of rewards, that's the thing people want, not punishments.

N: Yes I like rewards. Rewards are much more efficient.

K: It's already included in the calculations that the paper cup is more expensive so why not make that show in the price? That's possible. Pay for the cup…. But then you lose the whole gamification thing yo maybe that's not desirable.

N: But I think this rewards thing… Making people really feeling good about it. Like a cookie would make me feel good and I would associate it with the cup. If you give it the first time around that would be a really good initial start I think.

M: But making people feel bad also works though.

N: Not as well. Psychologically rewards are much more efficient in learning new behaviors.

My: We talked with Jimmy about the cups and he said paying for the paper cup like 1 kr it's not so much but then you think ok I have to pay more. But if you say you have 1 kr less because you take the mug, it's ok, I can afford it, I can afford that 1 kr more. It's the way you present it, it's more like a punishment in a way when you take the paper cup or it's like a reward when you take the…

M: You can do both.

My: No but it's just the way you present it.

N: I think there is also a problem there that the math itself is a hassle. I mean it's 1 kr but you still have to, oh then it's cheaper than that. So you have to think about it and it's easier not to think about it. So if you add 1 kr that makes the paper cup more difficult because you have to think about it.

My: That's a punishment then in that case.

N: Yeah but there is more things going into it than just the punishment or reward.

K: And are you familiar with, anyway it's different tax when you sit in the restaurant or if you take away so I just realized that here it makes sense to promote the porcelain mug but I think a cafe at the city when you pay like 30kr for a coffee then it's actually more expensive when people are staying.

M: Yeah but that's why the reusable ones are important. They never come into equation and it's a bit of a stupid thing. If reusable one were really and cool and they were really good, then people would use them.

N: If you would want to have them.

A: I'm not sure but I think everyone likes stickers *laughter* That's a requirement for my idea. Like say that you have a recycle mug and if you use the recycling mug you will get one part for a bigger thing in stickers.

N: Like a puzzle ?!

A: Yeah like a puzzle, and the finished one is maybe a pig or a kitten or something fun and then you can just put it on your mug and when the image is done you can get a free coffee. And then on the recycling mug you can see if you have a lot of stickers. If it's full of stickers then you're like wow.

N: And it would show for others. You could show it off.

A: Yeah you actually want to show it off.

M: You could make this into an interactive cup thing.

N: Yes I like this.

M: If you could show this.

A: Of course if you get a porcelain mug you could get a sticker but then you can't show how cool you are.

N: Yeah and maybe, for the porcelain mugs that are at the coffee shop maybe you wouldn't want to have those with more stickers on because they've been used more times.

M: But you guys didn't want to change the cups right?

N: Yeah on your own cup it would be a good thing. It would be different.

A: When people are travelling a lot some of them have on their bags like flags, where they've been. And then you can look woow, that person has experienced the world.

H: And then you ask this person, where did you that these awesome stickers? How can I get them?

N: Maybe you can make these stickers international. So if you go to Denmark and you drink your coffee there…

A: You want to create cool puzzle things with the stickers.

H: So you usually connect it directly to the cup, the game itself.
N: Yes.

H: Because that's what it's about.

A: And if you forgot your refilling mug you can just add it on it when you get home and bring it next time.

M: But then you'll do that all the time.

A: But then people at least use the porcelain mug because say if you take a paper then you won't get a sticker.

N: Oh sorry you don't get a sticker because it's paper, I'm sorry.

A: If you recycle the porcelain mug you will get a part of the sticker and if you buy it with your refill mug you will get it instantly when you buy it.

N: I would really like one of these mugs. Yeah that would be nice I think *laughter*

A: Yeah everyone likes stickers *laughter*

N: Yes I like stickers. And this is a good kind of subtle way to show that you're environmental friendly.

A: Because have you guys experienced when you visited a doctor or dentist, then you get a sticker.

M: What? *laughter*

A: We always get stickers. My boyfriend got a sticker when he got vaccinated.

N: You still get them?

A: Yeah if you ask for them *laughter*

K: I always hated those stickers because I had so many holes when I was a kid. Then those stickers were stupid. It's a memory of pain.

N: Association…. So you wouldn't like these porcelain mugs with stickers you would feel the hurt.

K: Yeah exactly it's like oh the dentist all over again.

A: What would you prefer to get when you were a kid?

K: Ah, not being drilled. *laughter* Oh that sounded aweful.

laughter

H: Could you imagine, so we have some game elements that are maybe not so obvious to add, some kind of character or avatar that would represent you, you as a player, or the cafe or a group of players. Something that could be introduced at the cafe maybe not on the mug itself. Say like this character is healthy now because a lot of people used…

M: I would probably not like an avatar because they are always so childish, like it's very hard to design an avatar that feels…

K: Yeah I would more like to have like an ambient tree that grows and maybe sprouts and it kinda gets stronger and stronger the more… but it could be subtle. Because a lot of people drink a lot of coffee so it could maybe take years before it really grows. So in the beginning it's just a little sampling or something.

H: So that's then for the whole cafe or does everyone…

K: I guess everyone has their own tree, it's like my family tree, no.

M: But the thing is I wouldn't like to see my tree grow I would just be like oh my god I'm drinking too much coffee I need to stop this.

K: Really?

M: Yeah.

K: What? Why? Trees are awesome! *laughter* Everyone likes trees.

A: But it's like you're showing that you drink a lot of coffee and not that you're environmental friendly, yeah then it's the opposite.

M: Then don't drink so much coffee if you wanna be environmental friendly. It's extremely unsustainable to drink coffee. Dot.

N: Yeah you shouldn't do it.

K: Well for who?

A: But it's just for pleasure it's not like…
K: But it's also without the coffee industry there would be… a lot of people who really need their crop revenue that wouldn't have it.

N: Ahh. That's kind of a circular…

K: Yeah but it's not that easy.

N: Yeah but let's say it's tea because it's the same problem with mugs… Or well

K: What's the difference?

N: But you know you could have birch tea you can pick it in your own garden that would be kind of environmental friendly right *laughing*

M: Yeah but the avatars, if there was like more of a metaphor, that's more interesting.

My: So you like a character, or character-like for everyone or for each person?

N: I would prefer to have it like for everyone because I think for me myself I wouldn't really spot the difference between each visit because perhaps it takes three days between each visit. I mean what does the tree get? One more leaf? When it's up to a hundred leaves can I really tell the difference between 100 and 101? I would lose the significance of it I think.

M: Maybe if you would be a group of friends that you could talk to each other about how your tree or your whatever is doing. Then you would all make a collective effort.

N: But would you do that? Maybe you would do that for a week or two.

K: Maybe for everyone as well that could be interesting to have something grows or diminishes, so there is a negative scale

N: Yeah and it would build on your relationship with that specific cafe also, so that would be a good business for the cafe.

K: Here in our cafe we are contributing.

A: Look at our tree! … But also this could feel like hopeless if I'm using the porcelain mug every time and everyone else is taking the paper cup I would like … *laughter*

H: You have to go to these people.

A: And I would be why should I be environmental friendly because it doesn't matter, if not everyone is contributing.

M: But then go talk to other people and you would be like yo why are you doing this, like I'm making an effort here.

My: Then it's peer pressure.

N: Think about the trees

K: Yeah but we've all been there. We're recycling at home and then you go down to the junk station and some idiot has just thrown glass in the… you know it's like…

N: Why am I even…?

A: But still people do it.

H: so do you think collaboration or competition in that case would work better? if it's like, a competition may be between two cafés or between you and me.

N : I think a combination...

H: Or is it rather something that I would say ok, I encourage you to also do something so we work together to make the …

M : It should be a combination

A : But I don't want to collaborate with people that I don't know

M: Why?

(LAUGHS)

K: because they don't like stickers?

(LAUGHS)

A: It would feel like, oh I collaborate with people that I have never met

N: Why wouldn't you do that? I mean, you pay taxes, that is a collective collaboration with people you don't know

A: I like to collaborate but in this particular case, I don't feel like oh this is fun I want to collaborate with people I don't know. It is like I don't get a WOW feeling

M: but if there is a collective achievement, you would care about it

K: Yes but the bigger it is the less you feel … and that is why we have a problem. I think everyone is aware of the problem and it is still like we make this decision

N: the responsibility is diluted by the number of players

K: too many players

H: That is the issue we had, thinking about public buildings... if it is at home and you have to collaborate with your family sure that is a thing, but if you're at a public building where you probably don't know everyone, how can you still

A: it is nice to collaborate but...

N: but maybe the it is more important to have an adversary like we are competing against I don't know what, Stockholm or whatever

A: yeah then I would collaborate

N: then maybe, it would.... Let's go together in Gothenburg and ...

M: but it would be the same between campuses, Lindholmen and Johanneberg, then everybody would be on top of it. You know it is like, we are gonna prove that we are better

N: it is about picking the right adversary

M: you could have sub-groups as well

N: because then you would feel like a part of the whole

A: and it is like in the gamification, I think it's important to think of those aspects. Like what's the aim?

N: watch the game for me

My: so having a common enemy

N: yeah that's important

K: Also, I think it is nice if you have a lot of … If I can identify an enemy but maybe M, she thinks of another enemy and we contribute to the same thing by having our enemies but they are not the same really

M: yeah that is a thing, you can have layers, so if it is like, if you're competing for chalmers, maybe, you think it is important to compete for chalmers, I don't give a crap but I want to compete for Gothenburg, right , so we would both be contributing for the same thing but we don't have the same interest like I am actually trying to beat him

K: it could be fine to beat someone else perhaps

H: ok so different kind of challenges that everyone can...

N: yeah so everyone can find something to relate to

My: I am going back to that idea of the tree, we build the tree, but with different goals for each person

A: they are not strangers anymore, because we have something in common

M: but if each café would have a tree, and then like all the lindholmen's cafés have a common tree that is built up out of all the trees and you could also even have a group of friends that has a separate tree that you can see online... it is the four of us and you know there is another group of 4 people and we are competing with them but we are all contributing to the same in the end like it doesn't matter

My: your level might be different

N: that is the branches in the tree...dfferent sizes and... so beautiful

K: then you have the seasons. so it was a really good idea with the tree

My: let's start over, it is winter

K: oh yeah everything died

(Laugh)

H: what do you think, would it work in the long term? I mean is it something that if fun for a month or ...

M: new stuffs needs to happen

N: but then maybe you don't have to... this is about encouraging behavior change and once the change has occurred, perhaps you don't, at least there is a lay time … we don't have to do much and then perhaps people are falling back into their old foot steps or whatever then you have to do something else. But I mean perhaps this is just an initial start, you don't have to plan for 50 years ahead

H : you have to reach a certain threshold somehow and then you see ok, people changed their behavior but you have to make surethat they stay on that level also

K: I think it has to be fun because I have a hard time seeing myself really caring for it to be honest... Usually I just go by the feeling, I want to have this today so I do that without like reflecting on it so it has to be fun to participate in the game, interesting, I don't know, maybe some nice physical thing where you recycle the mug or something you know like haptic feedback thing

M: but there could also be like daily tasks, daily quests thing, today we are aiming at using this many personal cups, right,and if you pass by and see it then you're like oh...

A: maybe then everyone gets a discount

M: yeah everybody would get a 25% discount

A: Maybe you collect oh thank you I would like to contribute

N: pay forward

A: so that they can have discount next day

M: Or it could be like yeah we are aiming at that this many paper cups are returned today and then you'll get like 25% discount on cakes when you've achieved the goal that day and it is different

H: So something that changes, this day it could be that, and the other day it could be another...

M: definitely a quest kind of...

N: but then at the same time if there were too many stuff like this I would care less I mean after a week or two, just everyday there is something

L: yeah when there is stuff everyday...

H: it can't be too much because then you get used to that

N: Because I don't really want to spend much thought about me buying coffee I have a lot of thing to think about

K: it would be cool if like the café says allright so we have a coffee price here we save this much money when you are taking like porcelaine instead. You will get the money we earn from you switching, so we just cut prices because of that so go it is up to you like go and we will show everything

M: but you know that cafés won't lose money even if they do this kind of thing like “if you return this many paper cup today you will get 25% on cakes”. They will not lose money because people will go there and actually buy more cakes.

H: even if they wouldn't buy it before but since it is cheaper

N: special price only today

M: then I need a cake

K: that is also the problem with the paper cups because this is commercial and some I mean Starbucks they had their brand on it so it is like commercial for them everywhere and others they advertise so they sell these pots so for them it is important to have like … I don't know, maybe you can fit the café profile like WayCup was a bit like, from what I understood, like very like eco and … you were able to feel a bit better about yourself but they still have one

A: Maybe an important aspect with the game is that the cafés have to like it because if they don't think it is a good idea it could be hard to...

N: they are an important stakeholder

A: and maybe like with this gamification coffee thing, people will buy more cakes

M: but they already do that with those cards where you put a stamp on it. when you buy a coffee you get a stamp and on your fifth coffee you get like

A: it should be really easy to use this kind of system

H: you talked about something haptic or something tangible could you imagine what that could be. I mean we know games can be on a screen or on a phone but maybe there is something

K: I just would like to … maybe the cup is really easy to just tear apart and then put like in a big box in a way and when it stacks up it is like a unit that gets like so you see exactly how much you're recyling everyday that would be pretty cool

My: so to have direct feedback

K: yeah some kind of sort of maybe you crush the cup yourself, I always think of that when I throw away the cup but you throw this container this volume there everything is just

N: you should just fold it

K: yeah some kind of nice smash and

M: I fold mine

k: you do?

M: you just have to press with your thumb at the bottom here on the side

K: Like that

N: now you can't use it anymore

K: Do you always do that?

H: I have never seen anyone doing that

K: maybe you should start to use porcelaine then

(Laugh)
…/...

M: not here as long as the kitchen looks like shit, I am not using porcelaine cups

K : I actually feel a bit ashamed now, I have a porcelaine mug but I never use it so

M: I have one of those reusable cups but I never use it. I already named my reasons

K: Actually, several time they would like us to introduce like a cup like that (KeepCup) but we said no to that because it was only about marketing, because they said like oh if you introduce this you would probably get this much but people stop using them after a while so we thought it was kind of irresponsible, we dropped that

M: there are a lot of pages

My, it is just for us

H: there some game elements here that we could use, like minigames, but maybe that is the challenge that you were talking about that it is everyday something slightly different to the day before, something that is part of the whole

L: it has to entertain because I guess you can be bored after a while

H: would you then fall back to the old behavior if you get bored or would you maybe just ignore the game and still take the right cup

K: Maybe you get invited to a really fun game if you drink up your coffee and at the bottom, there is like a QR code or something you can scan and then you get into that game

M: QR codes don't work like people don't check them out

K: but maybe something fun at the bottom in a porcelain cup

A: maybe a ticket

K: maybe WiFi

M: WiFi password

My but then that increases the consumption

H: yeah the thing is we don't want really to encourage people to drink more coffee

M: that is the thing, it is so hard

H: sure if it is a competition and you get points for each reusable cup you use and drink more coffee, that is not the point

My: that is why competing for the café for example, it means that if you drink two or three coffees it doesn't change that much, it changes for you but it doesn't change that much for the café so it can help not to change the behavior to increase the consumption if it is with all the others

K but maybe when you get down to the bottom you scan it and then you get a discount like afterwards. That is a bit boring it is not much of a game

M: that is so used also, I just tend to ignore this kind of shit at this point. Because then I will all forget it is kind of like you add these points to theses and then it is like super complicated and I just want my coffee and I want to get out of here

N yeah definitely

M: I don't know, I just really think if the reusable cup would be as cool as stickers are I'd rather not that much of a fan of stickers I am sorry but if you would have some kind of display things that would change and show my status you know like environmently friendly or whatever then I would like to sit in public with it

My: talking about that status, could it be like an avatar on your cup

M: Sure (not convinced) or a badge

My because we were talking about that avatar for everyone

A: and you want it nice and clean, because the con with the stickers is that it gets quite ugly especially if you get to wash it

N: it would be better if the mug looked more beautiful

A: in my imagination, the stickers could be good but in reality

M: you should just have like a screen band

H: something that you can attach and remove maybe

A: personalized

K: if you have a cup like that, maybe in the beginning it is just two circles stacked on each other so you get a really small cup of coffee and then you can buy another one and get the third and suddenly you have this

N: Look at my cup

H: really good to carry around

K Look at me I am the coffee wizard that is awesome

N: I just get all these freudian vibes. That is so huge

M: are you compensating for something?

N: Sorry

M: you're the only guy sitting here

N: I like the idea

K: you only think of sex

N: can you blame me?

K: no I am in minority here so

N: That's hilarious

M: but do you imagine hopefully that band would be like cool this thing (showing the rubber around the cup)

H: yeah right there is already something

M: There is stuff that is like this already so if it would show some kind patterns, things that move , show your status of how much you have refilled this cup

H: yeah it can glow, it can be light and colors

N: How good of a person you are

M: so it kind of gently shows how much you have been using this cup, how good you have been at taking it out of your home, which I am terrible at

H: so you think it should still look good if someone doesn't know what it is

M: it is just a thing

H: it just looks good and doesn't

N: no dead seal

M: it could just be patterns that only people that are in the game kind of know what it means so like the more they have for example these vertical lines that are orange then you know, whaou that person gets the cup out everyday but if they are blue oh you haven't been using your cup a lot

A: the I would prefer the paper, because I don't want to feel ashamed of not using my recycling cup

N: yeah if I have too little

M: only the people that have will know and you can probably fix it easily

H: maybe you wanna to decide yourself when to display it and when not maybe if you say you're ashamed now because there so many people who have the same cup but
then you just turn it off so you don't show

M: while you try to improve your thing That could be fair enough hide your score until you are proud of it

H: maybe some people don't have an issue to show that today they are not so good

M: maybe they are just newbies and they can be helped by other people who have like really cool cups, if they bump on each other, he gets a little bit of my points just because he did that

L: maybe personalize would make it nice you can show it to

H: would you actually go to a person who has this fancy cup and you have only a little bit of whatever

M: this is a matter of... not that I am shy. But to my friends I would do it

H: would that be something that would make you consider, oh whaou

L: oh yeah that's so cool ...

M: that is a good backup plan actually. Look at you cup, cheers, you know .

H: I don't know

M: I haven't been dating for a while

(Laughs)

A: oh how does your cup look like?

H: how do you like your cup?

M: I didn't say anything

L: it is a ice breaker

K: I won't go to a girl and say you get nice cups

M: it is one cup

K: only one

H: Well doesn't make it better

K: I think also that maybe you see someone has full … ah get over yourself. I am a bit more

A: But you could say I can buy a coffee for you and your cup would get red

(Laughs)

N: should I turn that cup red for you . That is nice

M: was this what you had in mind?

H: yeah that is exactly that (irony)

N: a dating game.

A: instead of a dating site. This is the new way of dating

K: Maybe in a way that you can build like a game mechanic out of like cups keeping in touch with each other instead so if the same cup meets a lot of other cups probably that user is very

M: it is like the latte mama's dream

K: yeah sort of

M they're gonna be the champions of this city

A: but maybe for single people, say that this one is red if someone is single and it is blue if somebody already has someone. When you're at the café alone and people can see oh you're single and then you use the recycling mug just to show that I would meet someone

M: there could be a lot of these dynamics, like really gentle symbols that only people that know can read them maybe, I wouldn't have known that what she meant... I am using my cup just to meet my friends and I have this status thing

A: and maybe you switch signs on them so then I don't want to be interrupted

M: and you can control it from your phone or whatever so you can just switch the

L: yeah interact with it and change the functionalities

A: so then it is like about something else but it also makes people use the recycling mug

H: because you can only do that thing with that cup

N: it is basically, you just increase the value of the cup

H: that is some kind of reward but not really obvious like you get discount but you get something more fun with that

M: personalizing things always works if you can show your personality through something. that is a selling point

My: on the other hand, could it be something that you take off of this cup and put it on this one

M: if you can do that you can cheat the whole game

N: but I think it could be nice if you turn this thing into some kind of networking thing like you can invite your friends and they get a special thing for that

K: Maybe you have like a long range RFID and you measure how many new cups your cup is meeting and you can if you break that cup, you can unlock the tag out to change it to something elsebut then maybe you only bring your tag

L: and it takes less space

N: but that would also be cheating I mean in games you can cheat but you don't do it because it is cheating

K: I had a colleague who got yelled yell at in Candy crush because she set the time and apparently that was not okay, you know you're a bad person when you're not wasting your life. It is a fact

H: I think that we alsways have to consider that people will somehow find a way to cheat or so but then that is their personal issue

A: and you succeed if people like the game and if they would like to use it

N: perhaps if other people cheat and get lots and lots of scores then people will try to get the same amount of scores and perhaps it would have a good effect anyway

H: maybe it will push the others that's true

M: in any case, if it is a kind of tag thing that you put around the mug maybe you could in some way actually distinguish what kind of material it is been taggeg to. It is not very hard to distinguish if it has been tagged to a paper cup or to a porcelaine cup

N: no hard soft

L … on a paper cup

M: not only that but you lose points

H: we'll go minus instead of plu

M you'have made a mistake

K so maybe all the cups in the future they are missing the bottom

H: they have to be the same size

M: but a tag thing that you could attach around your wrist would be so much easier to use like If you want to transport it. It would be easier than having this chip that you have to attach to cups
That thing would be perfect (keep cup band)

K: maybe you can just put it around and the heat is doing something I don't know activate it

M: that would solve the problem of people that use two cups, the function of this is make use less cups

H: yeah you can hold it

M: so it is nice if it is one of these elements that you put around the cups then it is a double function

H then if you don't use the game function, you still use the band

L... when it is on a paper cup it could show something very ugly

M: then you get the picture of that baby seal

N: you would never use paper cups again

…/...

N: I think as a customer the cup is what I see, I don't about think about the content much like that but I do feel and touch the cup so that is very natural

My: that is something that you carry around

M: there has to be an Object of identity and that is the thing if you go to different cafés. If it an object to you that identifies for yourself it is much easier to get any game going

K: for me often the café represents the identity, like if I go to Starbucks and get a cup to go it says something about me otherwise I would have gone to someone else but obviously I go to Bulten because that's awesome

N: always a regular

M: but then your tag could say whenever you've gone to that café

…/...

K: I think it is really cool if you go in a direction where you can change the purpose because it is not easy to say that porcelaine is better because sometimes it just isn't so it would be cool if the game could be like adapted to different so it could direct to a eco friendly like on demand. The objective is the same but it different how you carry out the task. That is probably super hard

M: It could be our personal decision so if you're showing that you're going for paper, you're a paper cup recycling guys, that's your thing. But you know I am the porcelaine user that is my title thing. Then we would get a discussion started, because you would sit and say why are you going for paper? Porcelaine is so much better!!!

11.4 Appendix D: Transcripts of interviews with participants after the user study

11.4.1 Interview 1

comments:

- *both not very talkative, come up with few own suggestions but rather confirm or decline questions of interviewers. interviewers talk quite much and might have discouraged or overcharged them.*
- *interviewers offered many different options which made it difficult to choose*
- *if interviewees turn out to be rather shy/reserved it's better to ask less at once but more defined questions that are easy to answer.*
- *make sure to formulate the questions right, know in advance what you want to get out of it*
- *make sure to have only one moderator and the other one does not interfere*

went to get about 5 or 6 coffees during this time and played the game 2 times each

purpose of the study
no real idea aside of showing how many people use paper cups
a way to make people do certain choices with fun stuff or weird stuff

and obviously the fake competition thing helps

how the feedback works
I didn't actually see anything except the blocks falling down
the blocks represent reusable cups
when someone takes a paper cup they destroy a piece of a block

In the first week when there was no game I wasn't really paying much attention, I was mostly just pressing the button
It was one fun push and that was it
I took a look but I didn't think any deeper about what they represent
I think I looked at the big screen once and saw that it showed the same thing and then I only looked at the tablet
I just kind of thought it would happen something else there, but I just saw the same thing

game, go to get a coffee
no problem to read and understand what to do (tablet)
haven't tried to cheat/play without a reusable cup
the buttons are really good, it feels satisfying to push

oh, so we have more trees now. ja I just saw it now

maybe the amount of fills are related to the amount of trees

used a paper cups first time they bought a coffee and didn't use it because it said they couldn't play. how did it make you feel? "very bad" (ironic laughter)

The first time I played I got to place two blocks, maybe someone forgot to play. or is that a feature? … I was a bit surprised because I got two, but it was nice

go back to table, go through process

when I bought a coffee I pushed the right button, when I bought a coffee in a reusable cup, then I went to pay and over to the other screen to place my block. I didn't really think about the tree actually

yeah it was more fun in the second week. well it's just fun

guys recognized where their tiles are.
it's weird but it was more fun to place your block and choose the color. it's because you have the choice.

difficult to say whether I would have played without being a participant/
if I would have noticed I would have played. because the tablet was pretty discreet, you don't always look at all the things
I think I might have done it anyway because the tablet is just pushing a button, but if it says I can play a game then of course I wanna go and check it out, so I think I might have done it anyway

were you satisfied when you found out what the game was? yeah it could have been more, but this was also ok :)

competitor
yes it was nice to see that we are in the lead.
what would you want to happen if you win over the other? like small fireworks and then just one empty cup once again
a reward? - yeah I haven't really thought about it
I just thought it was fun, maybe not even as a competition thing, just to see ah this goes on over there, some kind of connection (to the other cafe) (they knew the cafe at Lindholmen)

collaboration
it was pretty fun, we bought a coffee this morning and placed our tiles and when we came back we saw that ah there is more. (maybe a little bit sad if it would be destroyed)
I would feel more attached to it if I could customize it. like a small tablet or something where you can draw or to choose a letter. yeah I liked the personalization part.
Oh yeah that would probably add a bit more fun, if you had a webcam
yeah I think people would like that (symbols of the different sections). that would create another kind of competition
and if you would have letters people could write stuff, good and bad of course :) but maybe people think that's fun

reward for winning over the competitor
yeah that would maybe make me more motivated but I don't know if I would actually buy more coffees.
yeah I think it did something, it was fun to compete and to see… it's always nice when you're winning
you could have like a small scoreboard or something, so everyday or every filled cup
I'm trying to think what could be a nice price but it's kind of hard if it's for everyone to play

….

just because it's so simple I think I would play it for a while. it's just a few button presses and it's kind of fun to place your tile. As long as it's that simple I would probably keep playing yeah I don't wanna spend much time on it.
maybe if it was there for a few months it would get boring, if there wasn't any point to it any longer then I would stop playing. but I would probably keep playing for a few weeks

it would be cool if something secretly happens, if there is a chance that something happens
it would be cool if it stayed a secret and people would start talking about it and you can actually win things
and if you could have some combinations of colors that maybe if you put for example four hearts in a square something happens

but I think if it was even just one secret as long as it stays a secret. people would probably think there are other secrets and just keep playing

minigames
as long as it's not too complicated, it has to be pretty simple otherwise I might just leave, because often if I get my coffee here maybe I'm on my way to somewhere else or maybe I'm sitting here and doing something, studying. you would have to keep them pretty short

maybe you could have some kind of… if you place your tile it says if you want to play something and you could just go there. if you have the choice to play or not play

game accessible outside café
prefer to have it here in the café
I would need to get some kind of reward if I played it outside, cause it's more of an effort to go to a website and so on. you would have to add something extra then maybe

time and effort is important,
especially when I don't really know what the goal is
right now, even though I don't really know what the goal is it's so short I will do it and it's kind of fun, but if it takes some more time and effort I wouldn't think it's worth it

but watching this from somewhere else… I wouldn't just go on a website and check how is the cup but maybe if you open your phone and it's there in the background, oh there is a cup (not very convinced) that's just one idea
there is no point in just going to the website and there it is

identifying with own cup
would be pretty cool if your special picture showed up when you buy a coffee
showing it (band around personal cup) maybe if they were nice looking, I would go around bragging with it but I could have it on my cup, sure

if I had a cup like that and someone would just come and tell me you can customize your tile and put it on your cup, like right now, then why not, but hm…

one thing, talking about checking this on an app, if it was photos. If you see the picture over there on the screen and you think oh that looks cool or that person looks weird you could go in the app and just push that tile and you get a bigger picture. if you have pictures then you check them out and enlarge them because right now they are pretty small.

like oh is that someone I recognize on the photo

add/remove something
good if you could get some feedback for example that the background changes because I didn't realize that at all. so maybe at the moment you place your block, a flower pops out or something then you would get feedback, oh something happens
now that I know about it, it's nice to have the nature element
I like that there is a connection between the idea and the environment
animations when buying a cup, like a squirrel running around and that's all you see when you place your block but it's something. And if you have a lot of these small things you get interested like oh what's happening.

change behavior
already used reusable cups before but one says he didn't really use as much reusable cups before

maybe it was part of the game but if it says oh you don't get to play maybe people don't push the button at all instead of.. that could be a reaction. that kind of feedback might make people play less. maybe be more encouraging… that's something I thought about

11.4.2 Interview 2

Explanation of the feedback system from one of the participants to the other one
you press one of the button and to fill the cup up, you press the reusable cup and you get a tile that pops. The goal is to fill the cup before the paper cups win. the impact is different(5 vs 1) otherwise it would be unbalanced
At the beginning I didn't understand what happened, because I didn't notice that it was ⅕. Then I understood and I wanted to play all the time and I doubled my consumption

Purpose of the study
Environmental mindset, raising awareness about waste consumption

did you have to read the instructions
it is just 3 buttons, but I hadn't done it before I would have to read the instructions because there could be more choices
I would look at the instructions when playing

About the competitor
they really believed it

Fun aspect
The game was more fun because you can interact with it but if you don't have the time that can also be a bad thing
overall game is more stimulating
the feedback looks more like the one they have in shops

did you look at the main screen (feedback)
when I understood that something happened, because before, I didn't understand that it was a game to follow

About the customization
The important part is that you can participate, then the customization is fun so I can show my friends, look that is the one I put in

How long would you play
in the current state: 1 week or two
it depends if there is some benefit of it, if there is any feedback or free coffee

Would it be more engaging if you had more options?
That would be really good, I actually thought when I first tried it that I would be able to make my own. I would like to have my own so I could show to my friends: these are Vincent's tiles

would you keep track of your tiles in the current state
probably not, only when adding it

and with your personal picture?
of course, I would also be more enthusiastic about showing to my friends

would you rather compete or collaborate with your friends?
I would so much compete

about competition with the other café and collaboration with your friends
When I played for the first I went down to our board room and told them: everyone, you gotta go up to play to win over café C. They said yeah sure, I guess they didn't do it but I was very enthusiastic.

Is it just to win over them or would you need another reward
It feels already good without reward to create awareness about waste, to apply it in reality not only theory
I had fun but I think that to get everyone involved there could be some kind of benefit, something small, like if you keep track, how many times we won, how many times they won concrete numbers
these many cups have been filled, some real feedback about the evolution
make people aware of the goal of the game

lucky spot
if you know that five spots are free coffee, I think everyone would try it

It looks nicer to the eye when you don't have the symbols. it destroys the harmony.

Have you noticed the change in the background
Now that you say it, yes but otherwise I didn't. That's pretty cool. If you play it like two weeks, you would notice it I guess. Or when it resets

You talk about many cups: what do you would be better several cups or one cups and it takes longer to fill it?
A combination, depending on how many people go into the system
you should change the size of the cup, but also if people fish a cup, they would happy. Maybe not after the 2nd cup: that was just another one

The goal of the game is to be played once
then I would go for one big cup

You don't agree
I really like this cup, it should start over every week
You make a much bigger impact this way. You can put the old cups in the corner, so you can see we didn't fill it last week, we have to do it this week
Comparing/information is better for us, the more I know, the more I would try it out

Information/profile on the cup
I am not interested in sharing how many cups of coffee I drink because you don't know what happens with the data
I wouldn't like to be part of statistics

if it is anonymous
The only reason I would like to get a personal profile that would identify me is to compete with my friends
Then it is okay

What if the mug could show to other people the tiles that you added: private vs show off
the cup should be a way to simplify the process
example of the café in Lund where people registered their palm (veins) to simplify the process of paying: it goes faster

if I want to show what I did, I can go to the screen with my friends and say look

connection from outside
No it should stay within the café. I don't want to show it on my phone

mini-games
it should be about coffee, it has to be fast
I like the idea because of its randomness

playing on a device (phone) during the queue
you have to download an app, it is a lot of work but once you have done that, sure why not it is cool
or it would be like a quick mini game that just pops out, one question
you could have a common cup for everyone for the game and then you have a personal cup for the question that you fill up by answering

behavior change
it changed my behavior, after two weeks I have a bad conscience, and I changed. I will probably keep using those to some extend, since I am aware of it, I won't switch back. The problem is to have a cup that is not too big and that you can bring with you
I didn't even notice that there were reusable cups. I have my own cup but I hadn't even thought that I can use it there. I know I will use it from now

How long should the whole concept be played
a couple of weeks, a month
one, two months

add ons
The restaurant should be interested
both ecology and restaurant's interest: mutual interest, win win
not a problem even if only for the restaurant's interest if well done

it is good to have the direct feedback next to the coffee machine because even if you don't play, you think about it and you're in the game