

Unravelling experiences, barriers, and design strategies for encouraging reusable takeaway cup usage

Laure Herweyers , Els Du Bois and Ingrid Moons

University of Antwerp, Belgium

 laure.herweyers@uantwerpen.be

Abstract

The increasing use of disposable takeaway cups negatively affects the environment due to their non-recyclability and waste. This study investigates the adoption and sustained use of reusable takeaway cups in Belgium, including routines and experience. We did structured interviews (n=58), a survey (n=300), diary studies (n=8) and interviews with baristas (n=8). The findings provide recommendations including clear communication, incentives, and user-friendly cup design. Future research should test interventions and consider regional and cultural variations in sustainable coffee consumption.

Keywords: sustainable design, behavioural design, single-use, reusable, takeaway cups

1. Introduction

The coffee industry is growing rapidly, and alongside it the use of disposable takeaway cups. The global disposable cups market size was valued at USD 11.88 billion in 2020 and is expected to grow at a compound annual growth rate (CAGR) of 7.2% from 2021 to 2028 (Grand View Research, 2020). Approximately 500 billion coffee cups are globally produced each year (Gitnux, 2023). Many takeaway cups are made from plastics, like Styrofoam and polypropylene (PP) or polyethylene-coated paper, which retain heat well and prevent leakage, but are single-use, not recyclable and resource intensive (Kanniah, 2021). The lids, sleeves, spoons, and straws are often difficult to recycle as well. Disposable cups cause a massive amount of waste since they are considered instantly valueless as soon as the beverage is consumed, regardless of their material quality and durability (Park, 2010). The consequences of this throwaway culture are reflected in both land and oceans. When littered, the cups often stay in a landfill for centuries, where they do not biodegrade. When they end up in the oceans, they can harm marine life, either by entanglement or ingestion of microplastics that transfer up the food chain (Kühn et al., 2015; Setälä et al., 2014). Hundreds of marine species have been reported to be affected (Jepsen and de Bruyn, 2019). It is expected that a growing resistance against single-use plastics alongside various governmental efforts to prohibit these items will lead to an increasing demand for paper cups (Grand View Research, 2020). However, the polyethylene (plastic) lining that makes the paper cups watertight as well as contamination of food waste makes them unrecyclable. It is a common misconception that paper cups are recyclable, leading people to put them in the paper recycling bin, contaminating the recycling stream (Environmental Audit Committee, 2018). Next to this, disposable paper cups also cause resource depletion, consume energy and water during production, and create waste, which is de facto unsustainable.

More sustainable and durable options are reusable cups, often made of materials like glass, ceramic, stainless steel, or durable plastics. The cups are mostly purchased for personal use, but cooperative systems exist as well, which offer customers the option to use a reusable cup for a small deposit. They

can later return them to the coffee shop or another participating shop and get their deposit back. An example in Belgium is the ‘Billie Cup’ (Billie Cup, 2023). As with other reusable alternatives for single-use products, reusable cups should be used a minimal number of times before they have a positive impact on the environment compared to using single-use cups. This is called the breakeven point or payback period (Fetner and Miller, 2021). People who have acquired a reusable cup should be prevented from going back to single-use cups and motivated to use the cup beyond its breakeven point. From here on, with ‘reusable cup’, we mean a cup that is meant to be used ‘on the go’, so not a porcelain mug that is used at home. In this study, we investigate the barriers and motivators to the long-term use of reusable cups from different perspectives.

Previous studies have investigated typical drivers and barriers for reusable cup usage and other sustainable behaviours on both an individual level and an institutional (regulatory) level (Sandhu et al., 2021). Since institutional interventions such as environmental policies often proceed very slowly (López-Bao and Margalida, 2018), exploring psychological processes as well as the systems and contexts which influence these are crucial to achieving sustained behavioural changes (Novoradovskaya et al., 2021). On the individual level, typical barriers found in literature are strong habits of using disposable cups, confusion about environmentally friendly options, and pervasiveness of takeaway coffee culture (Novoradovskaya et al., 2021; Sandhu et al., 2021). Less widely investigated are barriers and opportunities related to the context in which the behaviour takes place. Previous research on reusable coffee cups applying social practice theory (Mellick Lopes et al., 2015) argues that the limited uptake of reusable cups could be explained by the missing convenience element due to forgetfulness, a lack of comfort, and seeing others using disposable cups, but also because of apparent system-norm barriers related to the coffee vendor's practices. (Niimi et al., 2014).

Besides researching the barriers and motivators to reusable cup usage, several interventions to promote their use have been studied on their effectiveness (e.g. monetary incentives, providing freebies, and value- and intention-based incentives) (Novoradovskaya et al., 2021; Poortinga and Whitaker, 2018). From Poortinga and Whitakers' study, it appears that charging extra for a single-use cup causes the biggest increase in reusable cup usage compared to information posters, selling reusable cups, or giving them for free. However, little research has been done on (i) specific properties of reusable cups, related barriers, and potential design improvements, and (ii) the potential higher-level solutions that intervene on a more systemic level, both addressing other actors and the practices and experiences of the user on a deeper level. In this paper, we contribute to the knowledge domain by incorporating the design of reusable cups and cooperative systems, the perspective of the barista, the practices and experiences of user, and the meanings they attribute to drinking hot beverages from a reusable cup.

1.1. Objective

In this study, we investigate barriers and motivators to the adoption and sustained usage of reusable coffee cups compared to disposable cups, specifically within the context of takeaway drinks in Belgium. We complement these insights by addressing coffee (and other hot beverages) drinking habits and routines, and different contexts of use. This way, we move beyond the usage of the product itself and focus more on the overall experience of the user (Allam et al., 2013). Therefore, we look at the use of reusables vs. disposable cups from two perspectives: (i) the practice of getting takeaway, and (ii) the usage of the product itself: a reusable cup or thermos bottle. Next, we include the perspectives of baristas regarding the feasibility of reusable cups, to gain insight into potential barriers on their side. Ultimately, we want to offer useful insights for designers to create reusable cups and contexts that support reuse, not only to appeal to a wider demographic but also to keep the cups in use for an extended period. To research this, we propose the following research questions:

RQ1: What are the barriers and motivators for adopting and continuing to use reusable cups from the perspective of the user?

RQ2: What barriers do baristas encounter regarding reusable cup usage?

RQ3: How do the experience and routines of the user impact the feasibility of long-term reusable cup usage?

RQ4: What strategies or interventions could enhance the uptake of reusable cups and promote their long-term usage?

2. Methods and results

We chose a mixed-method approach (figure 1) including both qualitative and quantitative methods. This approach enabled us to triangulate the results and provide answers to the four research questions. The study involves a diverse pool of participants to capture a wide spectrum of perspectives and experiences. To investigate the first research question, we started by interviewing 58 takeaway customers in coffee bars. In addition, we interviewed coffee bar employees (baristas) to answer RQ2. We engaged 300 participants in a survey focused on coffee consumption habits and usage patterns of reusable cups, which allowed us to test our findings further with a larger sample size. We also go more into detail on the usage of reusable cups in general (not only for takeaway), and coffee drinking habits, rituals, and meanings (RQ3). The survey also served to find participants for the diary studies (n=8), which were employed to investigate RQ3 more deeply. In the subsequent sections of this paper, we elaborate on the specific methodology and the resulting findings for each research task in a dedicated chapter. Finally, in the discussion, we synthesized all the data from the multiple studies and formulated strategies and interventions to enhance the uptake of reusable cups and promote their sustained, long-term usage, answering RQ4. Below, we elaborate on the methodology and results of each study. For all studies, we obtained ethical approval and informed consent to ensure participant confidentiality, anonymity, and the right to withdraw from the study without repercussions.

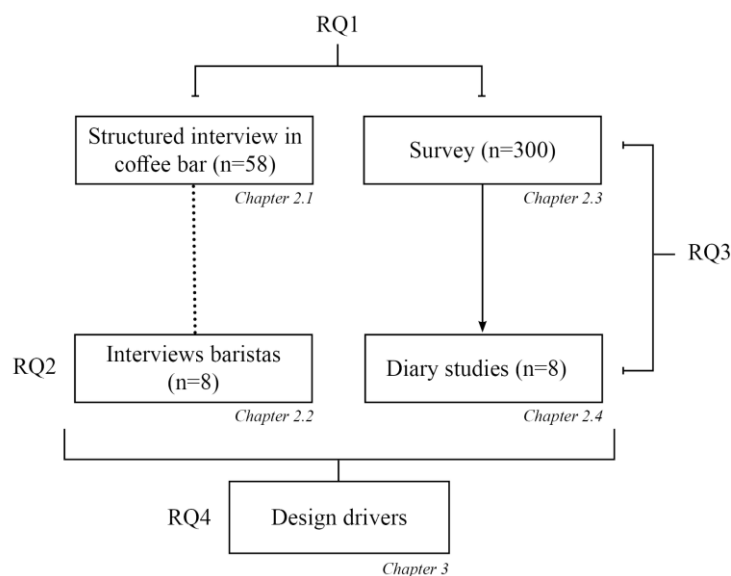


Figure 1. Research design

2.1. Observations and structured interviews

2.1.1. Methodology

In autumn 2021, we observed customers at eight coffee bars in different Belgian cities: five in Antwerp, two in Brussels, and one in Ghent. These coffee bars were chosen to represent various types, including those using or not using the Billie Cup system, which is more well-known in Brussels and Ghent than in Antwerp. The selection criteria encompassed factors like the type of coffee offered (e.g. specialty coffee), location (e.g., student or residential areas), atmosphere, and size (chain vs. small businesses). The observations were conducted randomly on both weekends and weekdays to capture a diversity of clients that do takeaways. They took approximately two hours in each coffee bar. This allowed us to identify various types of takeaway customers and invite them for on-the-spot interviews. We selected 58 participants across these coffee bars, engaging them in structured interviews. The interviews explored real-time behaviours, interactions, and preferences concerning takeaway cups. The questionnaire was set up in English (to include tourists) and filled in on a tablet. The interviews started with demographic questions covering gender, age, work situation, and whether participants were locals, tourists, or

commuters. We questioned their takeaway frequency and use of reusable or disposable cups. This was followed by specific questions tailored to disposable or reusable cup users. Topics included usage patterns, reasons for using either a reusable or disposable cup, physical properties of the cup, and any inconveniences faced. Demographically, 31 respondents are between the ages of 19 and 25, 16 between 26 and 40, 8 between 41 and 65, and 3 under 18. 31 of the respondents are students, 25 are working, and 2 are unemployed. Their takeaway habits vary, with 9 taking out hot beverages less than once a week, 15 once or twice a week, 16 three to four times a week, 9 five to six times a week, and 9 daily. 43 respondents are residents of the city where the interviews were conducted, 10 are commuters, and the rest are tourists. The questionnaires were analysed descriptively.

2.1.2. Results

We questioned 39 people that used a disposable cup at the moment of the interview, and 19 that used a reusable cup. Although the majority of the respondents (52) believes that disposable cups are a problem for the environment, only one-third uses a reusable cup. Interestingly, two-thirds of the disposable cup users stated they had used a reusable cup before. When asked about the reasons behind choosing a disposable cup instead of their reusable one, forgetfulness, inconvenience, and spontaneity came up the most frequently. Other reasons for not using a reusable cup are COVID-19-related hygiene concerns, the size and weight of a reusable cup in their bag or pocket, and the inability to find a suitable cup. Potential leaking and the cleaning process are also indicated as being inconvenient. The biggest motivations for switching to a reusable cup are a commitment to environmental concerns, followed by convenience, such as retaining the coffee's temperature and enhancing its flavour. A few respondents mentioned financial reasons and because it looks nice or trendy. Half of the people who have a reusable cup (10) indicate that they don't always use it, and more than half (11) have multiple reusable cups. Regarding the material, 7 have a cup made of hard plastic, 6 stainless steel, 2 recycled plastic, 2 ceramics, 1 bamboo, and 1 silicon. Regarding other properties, 9 have a cup with a sealed lid (no leaking), 5 have a cup with an unsealed lid (potential leaking), 3 have an insulated cup, and 5 have heat-protective sleeves. The biggest inconveniences when carrying a reusable cup are forgetting it (7), the volume and weight when carrying it (5), and that it leaks (5), which fits with the reasons given for using a disposable cup. Overall, metal and hard plastics are most preferred by both reusable and disposable cup users. Bamboo or ceramics are not very popular. Three quarters of the respondents stated they would switch to reuse if they would get a discount on their drink, while almost half would use Billie Cup if they could return it somewhere convenient.

2.2. Semi-structured interviews with baristas

2.2.1. Methodology

We conducted in-depth semi-structured interviews with eight baristas from the initial study's coffee bars. The goal was to gain insights into their perspectives on customer preferences, the demand for reusable cups, challenges in promoting sustainability, and strategies to encourage reusable cup adoption. Each interview lasted approximately 40 minutes and was recorded and transcribed. We analysed the results thematically using NVivo software. We began by exploring their perceptions of takeaway and in-house consumption and its evolving trend. Subsequently, we delved into their experiences with reusable cups, customer profiles, common types of reusable cups, and their efforts to promote their use, including any financial incentives or selling branded reusable cups. We also discussed barriers to providing and promoting reusable cups, as well as their interest in joining the Billie Cup initiative. The interviews allowed for open conversations and in-depth exploration of various topics. We analysed them using open coding in NVivo software.

2.2.2. Results

All interviewees noticed a significant increase in takeaway orders in recent years, particularly since the COVID-19 pandemic. Depending on the type of coffee bar, take-out consists of roughly 20% to a majority of the orders, mostly in student areas. However, only a few customers bring a reusable cup, which forms a minority of takeaway orders in most bars, except for one that exclusively uses the Billie

Cup system and has no disposable options. This aligns with our observation results, highlighting the continued prevalence of disposable cups. Nevertheless, the amount of reusable cups is slowly rising, and various types of reusable cups are emerging, including bamboo, metal, plastic, glass, coffee grains, porcelain, and creative options such as a jam jar. Branded cups sold by competing coffee bars are becoming more common, although customer awareness of their acceptability varies. Regular customers are more likely to bring their reusable cups consistently.

All interviewees are positive about the reuse trend, and stimulate it mainly because of environmental concerns and branding opportunities. However, some expressed doubts about the impact on the coffee-drinking experience. For example, one coffee bar actively searched for the ‘ideal reusable takeaway coffee cup’, with perfect mouthfeel, no taste coming off the material, and dishwasher compatibility, but found nothing that surpassed a porcelain cup. This led them to abstain from participating in the Billie Cup system, as they were unwilling to make any compromises on experience. Others share this preference for porcelain cups. Half of the interviewees dislike paper cups since they believe it alters the taste of the coffee, especially for filter coffee (without milk). In terms of different cup sizes, while some find it slightly inconvenient if a cup doesn’t fit under the machine, it isn't a dealbreaker for most. None of the interviewees considered a universal size to be necessary, given the existing variety of reusable cups. Customers asking for their dirty cups to be cleaned before getting a takeaway coffee is seen as annoying by some baristas, while others don't mind doing so.

Many interviewees expressed scepticism about the logistical aspect of the Billie Cup, such as handling excess or insufficient cups and dealing with cash deposits. They were also hesitant to clean cups that were brought in by customers from other coffee bars. The deposit system was confusing for some, and a few were concerned that the plastic material of the cups would affect the taste and overall experience. There were reservations about consumer acceptance, as the clients would have to drink from a cup that had been previously used by someone else. Although the bars that use or have used Billie Cup state that washing the cups requires more effort than customers using their own reusable cups, they still support the concept. The bar that solely employs Billie Cup occasionally receives annoyed reactions from clients for not offering any disposable options, but most eventually got used to the system.

Half of the coffee bars offer a discount for reusable cups, ranging from 10 to 30 cents to stimulate reusable cup usage. Two others used to give a discount but stopped. Communication about these discounts varied among coffee bars, with some failing to inform all customers. Particularly customers who don't use reusable cups would not be informed of the discount, which leads to missed opportunities for encouraging awareness. Five coffee bars sell reusable cups, mostly metal thermoses, of which three offer their own branded versions. One coffee bar used to sell cups but stopped because of the high costs, realizing customers could buy them cheaper online. Some bars sell cups of lower quality to accommodate customers with a tighter budget or offer a wider range of reusable cups. During the COVID-19 pandemic, some coffee bars temporarily shifted to disposable takeaway cups for hygienic reasons. There were concerns about potential contamination when passing cups from person to person, although these concerns have lessened in the years following the pandemic. All coffee bars resumed accepting reusable cups at the time of the interviews.

2.3. Survey

2.3.1. Methodology

We administered an online survey to a larger sample of 300 participants to gather a broader perspective on coffee on-the-go consumption routines and attitudes towards reusable cups, and go deeper into the reasons for (not) using a reusable cup. We distributed the survey by sharing it on social media and putting up posters with a QR code in several local coffee bars in Antwerp. For this part of the study, we wanted to focus on local residents of the city of Antwerp (Belgium). Since we wanted most of the respondents to be able to answer the questions in their mother tongue, we decided to set up the survey in Dutch. Data collection took place over the course of three weeks in November and December 2022. Qualtrics was used for questionnaire setup, SPSS for statistical analysis, and NVivo for open-question coding, ensuring privacy by not collecting IP addresses without consent. Initially, the questionnaire included demographic information (age, gender, working situation, residence, and family situation)

alongside inquiries about coffee and other hot beverage consumption. Among coffee drinkers, questions probed the significance and meaning of coffee in their lives, its relation to rituals and social practices, and motivations for visiting coffee bars. Data on the context of hot beverage consumption, such as the place, frequency, and takeaway habits, were collected. The survey further explored the use of disposable and reusable cups and introduced the Billie Cup, gauging respondents' familiarity and usage. For those owning reusable cups, questions included frequency of use, purpose of using the cup, its material, type of beverages, duration of ownership, and motivation. Additionally, respondents' satisfaction with reusable cups was assessed by means of a five-point Likert scale ranging from 'not satisfied at all' to 'very satisfied'. Those without reusable cups were queried on their reservations, potential future use, and ideal cup requirements. The survey ended with a request to participate in a diary study. Volunteers could fill in their name, email address and optionally phone number so we could contact them. Demographic analysis revealed that the most prominent age group is 19 to 25 years old, constituting 44% of the respondents, with the second-largest group being aged 41-65 at 31%. The majority of participants identify as women (60%). Regionally, 41% live in cities, 29% in urban fringe areas, and 30% in the countryside. As a result of the way we gathered respondents, it is of no surprise that out of the respondents that filled in the survey, a significant proportion are coffee drinkers (85%), with age correlating positively with coffee consumption (from 78% within the 19-25 group to 100% in the age group 65+). While coffee is prevalent, tea (78%) and hot chocolate (52%) also enjoy popularity.

2.3.2. Results

Half of the coffee drinkers have coffee several times a day, and older age groups reported more frequent consumption than younger respondents. 16% of them gets takeaway multiple times a week. 26 to 40-year-olds get takeaway more often than the other age groups, and only 20% of this age group never do takeaway. Of the 65+ age group, 79% never do takeaway. Specialty coffee places are the most popular choice for takeaway (38%), followed by work (24%), chains (18%) and lunch places or tearooms. Other places that were mentioned are Christmas markets, supermarkets, university canteens, school coffee machines, and train stations. The main reasons for takeaway range from breaks during work or school hours to day trips and city visits. One-fifth get their takeaway coffee when on the road between home and work or school, 23% during a walk, and 14% while working from home. Others get it for outdoor breakfast or lunch, or during a long train travel. Notably, a majority of coffee drinkers incorporate coffee into their morning ritual (61%), associating it with relaxation and energy. A substantial number goes to coffee bars for social interactions (37%) and general experiences and service (38%), followed by going purely for coffee (20%) and to work remotely (14%). Open-ended questions revealed that coffee holds various meanings, including awakening, energy, concentration, joy, relaxation, peacefulness, and a moment for introspection. Among those with reusable cups, Billie Cup awareness was low (22%), and among those who heard of it, usage was limited (15%). Of the respondents with reusable cups, 70% have possessed them for over a year. Notably, 61% of those owning reusable cups still predominantly use disposable cups for takeaway coffee. Only a small percentage use their reusable cups for takeaway (7%). Other uses are taking coffee from home to another place (e.g. work or school) (15%) and walking around in the office space or home (13%). The primary reasons for using reusable cups are environmental considerations (21%), ease of transport (15%), and heat retention (15%). The aesthetics of the cups also play a role (9%), as well as the cup being pleasant to drink from (9%). The most popular materials are metal and durable plastic, confirming the results from the first study. Among those without reusable cups, more than half expressed a desire to use one in the future, primarily for environmental reasons. Perceived barriers include inconvenience and forgetfulness. Respondents' ideal cup requirements encompass leakage prevention, compactness, easy cleaning, durability, heat resistance, aesthetics, user-friendliness, dishwasher compatibility, lightweight, no branding, size adaptability, ergonomics, comfort, and pleasant to drink from.

2.4. Diary studies

2.4.1. Methodology

We used the survey as a selection tool to find eight participants to engage in a two-week diary study in November 2022 to document their reusable cup experiences. We invited them to report on the usage

and related challenges and benefits in real-time through WhatsApp, using text, photos, voice memos, and emojis. Each participant received specific, tailored daily reminders. The study involved a pilot test, which was excluded from the analysis. Additionally, each participant underwent two interviews, one before the study to explain expectations and obtain consent, and another after the diary study to delve deeper into their experiences and possible changes in their behaviour as a result of the study. The selection of participants was based on specific criteria, including the possession of a reusable coffee cup, a minimum weekly takeaway habit, and willingness to participate. Out of 23 identified profiles, we invited 15 for intake interviews. Eight participants eventually started the diary studies, ages ranging between 21 and 32. Three participants were male, and five female. The group consisted of four students, one intern, and three working people. Data analysis involved thematic coding by three researchers, looking for patterns, emotions, barriers, motivators, and routines within the messages. A comparison was made between the participants to notice specific similarities and differences.

2.4.2. Results

A notable distinction emerged between two types of cups: those designed for takeaway, resembling disposable cups, and thermos bottles, which were praised for heat retention and leakage prevention. Interestingly, most participants opted for thermos bottles when enjoying tea, while they typically utilized the other type of cup for coffee. Common barriers included cup leakage, cleaning effort, persistent stains, wear and tear over time, forgetfulness, cup size (such as being too large for a coffee machine), taste, and limited opportunities for reuse at coffee bars and machines. Positive feedback was predominantly related to thermos bottles. Participants appreciated their ability to retain heat, their larger size, and the cost-saving benefits associated with their use. The motivations for utilizing reusable cups were diverse. Many participants favoured thermos bottles to accommodate larger volumes and to keep their beverages warmer for extended periods, both on the go and at home. At home, the thermos was found to be particularly handy for enjoying a hot drink without needing frequent refills. In some cases, the thermos was so effective at heat retention that the coffee needed to cool down before being consumed. Notably, one participant reported searching for a reusable cup and thermos for a long time, expressing satisfaction with their current choices.

Participants displayed a range of routines and habits related to their reusable cups. For instance, one participant reported a very strict routine with the thermos bottle, cleaning it every evening and always carrying it, whether filled or not. Another participant habitually stored their cup in the side pocket of their backpack after use to prevent forgetting it, while another kept the cup in their car. The importance of consistency in routine was evident, as an intern deviated from their usual takeaway coffee habits during their internship. The cleaning methods also varied, with one participant using soda to clean their coffee cup (with caution due to its inedibility). If participants forgot their cups, their actions varied from using disposable cups instead to abstaining from their drink or enjoying it at the bar. Additionally, some participants noted a shift in their hot beverage consumption patterns, with more consumption during winter compared to summer.

3. Discussion

Through a multifaceted approach encompassing surveys, diary studies, and interviews, this study aims to provide a comprehensive understanding of takeaway coffee consumption experiences, behaviours, and routines, perceptions towards reusable cups, and insights from baristas. The results contribute to a holistic overview of sustainable coffee consumption practices and avenues for promoting the sustained use of reusable cups. Next to this, the methodology we used allowed us to enhance and compare insights gathered with different methods, both quantitative and qualitative. It can be employed in the future to address other sustainability issues in a more systematic way.

In comparison with previous research, this study confirms the influence of existing norms and habits of using disposable cups (Novoradovskaya et al., 2021), adding to that the importance of creating new habits with reusable cups by e.g., taking them with you every day or keeping the cup in a designated space. Next to this, financial incentives could help persuade people to use reusable cups (as shown by Poortinga and Whitaker, 2018), and cups showing wear and tear are one of the barriers to long-term usage (Miao et al., 2023). The results are partly consistent with the findings on barriers from the barista's

side (Niimi et al., 2014), showing some systemic barriers, but we could also show some interesting changes in perception from the baristas, with many of them being open to using and promoting more sustainable options and some even going for fully reusable with the Billie Cup system.

3.1. Answers to the research questions

3.1.1. Barriers and motivators to reusable cup usage (RQ1)

The biggest **barriers** to making the switch to reusable cups for takeaway are the size and weight of the cup, potential leakage, and having to remember to bring the cup or anticipate going to get takeaway. Barriers to continued usage are persistent stains, wear and tear over time, the taste of the material, the size (e.g. not fitting in pocket), and no option for reuse at the coffee bar or machine. The **motivators** for choosing a reusable cup are mainly environmental concerns, followed by practical advantages such as the taste, feeling, and aesthetics being better than disposable cups, ease of transport and heat retention in case of a thermos, and financial advantages such as discounts.

3.1.2. Perspective of the barista (RQ2)

Some **baristas** find it annoying when customers do not present a well-cleaned cup. Most baristas are sceptical about the experience of drinking from a reusable cup, and how it affects mouthfeel and taste. Some give discounts to stimulate reusable cup usage, but not everyone communicates it well. Barriers to cooperative systems such as the Billie Cup are the confusing deposit system, having to clean cups used by customers of other bars, and the material and feel of the cup.

3.1.3. Experience and routines (RQ3)

Regarding the **experience**, we can look both at the meaning people give to drinking coffee, and the experience of using a reusable cup. Mainly the baristas put emphasis on the superior taste and feeling of drinking out of a porcelain cup in comparison with a disposable or reusable takeaway cup, with which some users agree. What is quite universal, is that the meaning of drinking coffee (and often also other hot drink drinks) is related to a moment of enjoyment, relaxation, 'me time', and a boost of energy. There are plenty of positive correlations that people make with drinking coffee. This can be played out in the design of reusable cups, and definitely a cooperative system.

It appears that people with strict **routines** regarding their reusable cup (always storing it in the same place, cleaning it every time after use, taking it with them every day, even if it is not used) are less prone to forget their cups and use disposables instead. Most baristas typically see a recurring group of customers returning with their reusable cups, often regulars, indicating the advantage of already having a strong routine. It seems that baristas have more ease in implementing little changes into their fixed routines, while users without a routine face the challenge of having to carry the cup with them at all times, just in case they get a takeaway drink.

3.1.4. Design opportunities (RQ4)

Based on our findings, we can propose some opportunities for designers to encourage the sustained use of reusable cups. A **universal cup size** could provide some benefits but is requested neither by baristas nor the users of reusable cups. However, a **cooperative system** such as Billie Cup has the possibility to adjust the sizes of their cups to the capabilities of the espresso machines, which saves time and increases convenience for the baristas, provided that the deposit system is better structured and able to address concerns about handling excess or insufficient cups, as well as the ease of returning cups. Clear communication about the system and its benefits can encourage customer knowledge and participation. Many customers who use disposable cups indicate that financial incentives could persuade them to use a reusable cup, but it has to be clearly communicated by the coffee bar to persuade clients to make the switch. Next to this, coffee bars can offer tiered discounts or **loyalty programs** that increase with each reuse of a reusable cup. This provides immediate financial incentives for customers and promotes long-term behaviour change. It can also help develop routines. Collaborative marketing campaigns can also emphasize the cost-saving benefits of using reusable cups. In terms of cup design, designers should

prioritize using **materials** that do not alter the taste of the drink, are durable enough to perform beyond their breakeven point, are lightweight, and avoid showing wear and tear after repeated use. We argue that there is room for both thermos bottles and regular reusable takeaway cups, as they are generally used for other purposes and have different requirements. Thermos bottles are expected to keep the drink warm for an extended time and contain more volume. Takeaway cups should be lightweight, and compact, and the content should immediately have the right temperature to drink. We also recommend designing an easy-to-clean, lockable lid to prevent leaks.

3.2. Limitations

The study's findings are subject to limitations, including self-report biases, limited generalizability due to non-random sampling, and the possibility of social desirability bias in self-reported behaviours. Besides this, the study was conducted in 2021 and 2022, which might not capture the full impact of the ongoing COVID-19 pandemic and changing consumer behaviours, as well as any new developments in sustainable practices. The diary studies only took place over the course of two weeks, so the results lack insights into longitudinal behaviour and changing routines over time.

4. Conclusions

This research aims to gain insights into barriers and motivators to the sustained use of reusable coffee cups. To do this, we investigate experiences, behaviours, and routines related to takeaway coffee consumption and perceptions towards reusable cups. In the end, we formulate concrete design recommendations to promote sustained reusable cup usage. The study employed a mixed-method approach, combining qualitative and quantitative techniques. The findings revealed several barriers and motivators to the acquisition and sustained use of reusable cups, related to habitual constraints, practical considerations, and user experiences, both from the user and the barista's perspective. Despite the majority of the respondents acknowledging the environmental issues posed by disposable cups, only one-third currently use a reusable cup. Participating baristas indicate scepticism regarding cleaning and the influence of reusable cups on mouthfeel and taste experience. The design recommendations derived from this research include the need for more streamlined and transparent cooperative systems, incentives such as discounts and loyalty programs, and an improved cup design that prioritizes materials, practicality, user experience, and leak prevention. Furthermore, the study highlights the opportunity to enrich the emotional and experiential aspects of coffee and hot drink consumption, including feelings of relaxation, enjoyment, and energy, through thoughtful design interventions.

Future research should investigate potential interventions and design recommendations with case studies in the field. Strategies for coffee bars to effectively communicate discounts and benefits to customers can be further explored, and innovative cup designs and material explorations should be tested with users, as well as the feasibility and effectiveness of cooperative systems in promoting reuse. It would be interesting to further research the differences in the use of reusable cups based on age and demographics, understanding the preferences and behaviours of different age groups can help in tailoring strategies and designs. Also, exploring how cultural and regional factors influence the adoption and use of reusable cups. Different regions and cultures may have varying levels of acceptance and practices related to sustainable coffee consumption.

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