Developing the '0U Cup': Promoting Ecological Behavior through a Cup-sharing Service System Based on the Comprehensive Action Determination Model and Choice Architecture

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Abstract

Background With the increasing international interest in and social awareness about plastic waste, Korea has also been focusing on the enforcement of disposable plastic cup regulations. In addition to government initiatives and tumbler use campaigns, studies for overcoming the limitations of existing approaches and inducing ecological behaviors should be pursued.

Methods Based on theoretical considerations of the Comprehensive Action Determination Model (CADM) and choice architecture, five design strategies were derived. After comparative analysis of three cup-sharing cases in Germany, the United Kingdom (UK), and South Korea in terms of social and cultural influences, an integrated service design model, '0U (Zero You) Cup', was proposed. The study model was verified through a four-day pilot experiment of its action-inducing incentives and self-sustainability designed in the environment.

Results Based 'circulation', 'familiarity', 'trust', 'cost', and 'transition' as the five strategies, the experiment showed a high return rate of 74.89% for the 0U cups, and demonstrated the possibility of the campus café circulation system using on-site individuals as both users and workers.

Conclusions This study serves as a starting point for the establishment of an integrated service design model for replacing disposable cup consumption behavior. The proposed model is unique as it proposed five strategies reflecting the socio-cultural environment of South Korea, considered individuals of the community as the core value of the model's self-sustainability, and discovered CADM's *situational influences*, and choice architecture's 'default option' and 'bandwagon effect' as a theoretical framework to cope with people's habit of changing their instant choices. To self-sustainably implement the current model, 'trust' and 'cost' must be considered in the future.

Keywords Service Design Model, Shared Economy, Sustainable Behavior, Comprehensive Action Determination Model, Choice Architecture

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1. Introduction

Both policies and products have been developed worldwide to reduce disposable cup waste. For example, in August 2018, the Korean government recommended a voluntary ban on the use of disposable plastic cups in stores, pursuant to the Resource Recycling Act. Since then, according to the Korean Ministry of Environment, the number of disposable cups collected per store has decreased by 14.4%. Meanwhile, Starbucks has replaced its plastic straws with a newly designed lid. This shows that government regulations can effectively shape businesses and control consumer behavior within a short period; however, the consciousness of people has not changed.

Product design and environmental campaigns have encouraged the use of reusable tumblers, but according to Lee Yun-hee (2019), a senior researcher at the Institute of Climate Change Action, "Tumblers are more eco-friendly than disposable cups only when they are used at least 14 to 30 times." As such, the continuous use of an eco-product is important. Therefore, a service design model that incorporates both government regulations and design/environmental campaigns should be developed. Ecological behavior that stems from individual spontaneity may yet be integrated in everyday life. Considering this backdrop, this study aimed to propose a service design model that naturally encourages consumers to opt for reusable cups.

This study derived design strategies from Klöckner and Blöbaum's (2010) Comprehensive Action Determination Model (CADM) and the choice architecture theory of Thaler, Sunstein, and Balz (2010). Although there are many other studies on searching for design methods for sustainable behavior (Daae & Boks, 2015; Hebrok & Boks, 2017; Laitala et al, 2012; Lilley et al, 2005; Lockton, 2013; Tang & Bharma, 2012), CADM and the choice architecture, reviewed in section 2, are the main theoretical foundation of this study model. The former is a comprehensive model of behavioral psychology, and the latter directly brings applicable incentives for behavioral changes in daily surroundings. In section 3, similar cases in Germany and United Kingdom (UK) are compared to the case of Korea. The physical, social, and cultural environments of domestic cafés were analyzed based on news articles and interviews. Section 4 defines the five design strategies, and accordingly, proposes the '0U (Zero You) Cup' model. In section 5, the results of a four-day pilot experiment in a campus café are analyzed. Finally, in section 6, the details and points of improvement for the model are specified for future research.

2. Theoretical Considerations

2. 1. CADM

The CADM (2010) shown in Figure 1 is different from its previous theories (Ajzen, 1991; Schwartz & Howard, 1981), as it places *situational influences* as a main determinant of people's choices. It schematizes the relationships among *normative processes, intentional*

processes, and *habitual processes* in decision making. CADM shows how *habitual* and *intentional processes* have a direct impact on decisions, whereas *normative processes* have an indirect effect.

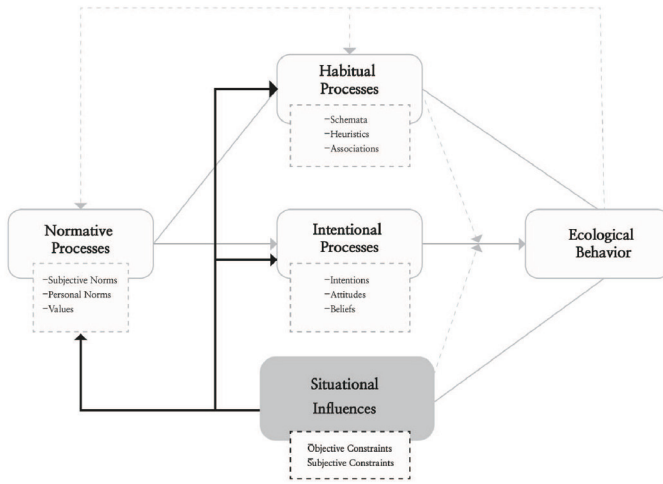


Figure 1 CADM (Klöckner & Blöbaum, 2010)

This model argues that environmental variables are the most important factors in changing behaviors. Most Korean cafés serve drinks in disposable cups—an example of how people's daily choices are often determined by *situational influences*, even though using reusable cups is a better ecological choice (norm). When people drink two–to-three beverages a day or carry unwashed tumblers in their bag (subjective constraints A, B), it becomes less likely for them to prefer reusables. Furthermore, although the use of disposable cups in cafés has been restricted since August 2018, having to wash tumblers in public or asking an employee to wash them (objectives constraint A, B) hinders people from using tumblers. To escape this vicious circle, the 'object constraints' placed on café-goers should be replaced with new *situational influences* that reinforce the preference for reusable cups on a daily basis.

2. 2. Choice Architecture

Choice architecture theory (Thaler, Sunstein, & Balz, 2010) explains that people's behaviors are affected by the layout, sequence, and range of options. This study focuses on the 'default option' and 'bandwagon effect.'

First, 'default option' describes why a large number of people choose the default options without questioning them. For example, the Behavioural Insights Team (2013) of UK in a collaborative project with the Home Retail Group and the Charities Trust changed the default from 'opt-in (to check a list of things in need)' to 'opt-out (to check out)' for an auto-acceleration program—Xtra Factor. This brought about an instant rise in the participation of new donors from 6% to 49%. This reveals that people prefer to choose without thinking. Therefore, reusable cups were the 'default' in our study model, replacing disposable cups. Participants of the 0U Cup experiment had to 'opt-in' for disposables if they wanted.

Second, the 'bandwagon effect' explains individuals' choices as affected by mob psychology. In recent years, many hotels have implemented "save the environment" campaigns. However, a research team from the Illinois Institute of Technology for the Brains, Behavior & Design toolkit (Cervantes et al., 2010) showed that people's active responses to messages related to their personal circumstances—for example, "75% of guests who have stayed in this room reused their towels." The 0U Cup experiment exposed participants to mob psychology. Participants could thus observe others' experiences while using and returning 0U cups in cafés. This served to spark curiosity among those who had unwittingly used disposable cups and further induced their participation. These action-inducing incentives were a baseline to develop an integrated serviced design model of product design solutions, campaigns, and related policies.

3. Studying the Cup–Sharing Service Design Model

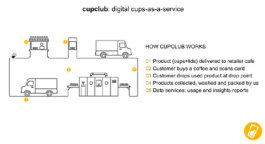
This section comparatively analyzed recent cases of cup-sharing services in Western Europe and Korea. To develop a contextual model for domestic café-goers and differentiate them from foreign cases, the social and cultural aspects were reviewed through news articles and interviews.

3. 1. Cup–sharing Services

Between 2015-2016, the cup-sharing service platforms, wherein customers had to pay a deposit to borrow reusable cups in cafés, were initiated in Germany and UK. Table 1 presents two European platforms and a domestic one. In 2015, CupClub™ in UK designed a cup with an RFID-embedded lid for tracking. In February 2020, they began a pilot program with McDonald's and Starbucks in Palo Alto, California. By providing an 'A to Z' service from delivering, washing, and collecting the cups, single-time events (e.g., festivals) can be freed from disposable wastes, thereby expanding the shared cup industry. RECUP is a leading German startup in the field started in 2016. Unlike CupClub™, RECUP does not provide the 'A to Z' service, and that limits the platform to expand. Similarly, Bottle Factory runs several rent-a-tumbler programs in Korea: a café without disposables, a catering service for festivals, and "your bottle week" campaigns with unused tumblers donated by people. Additionally, Bottle Factory launched a "return me" cup-sharing service in January 2020 similar to that of CupClub™.

Table 2 Cup–sharing servicess

Service Provider	CupClubTM	RECUP	Bottle Factory
Released year	2015 (service active 2018)	2016	2016
Strengths	–An RFID–embedded lid –All–in–one service –Unlimited applications	–Easy accessibility to service with 4,500 partners in Germany, Czech Republic and South Africa	–Rent–a–tumbler programs 1) Tumbler donation campaign 2) Tumbler catering service 3) "Your bottle week" campaign 4) "Return me" cup–sharing service

Weaknesses	–Pick–up and drop–off locations for cups are limited to partner cafés	Low accessibility to the service/return boxes due to its small numbers of partners
Service Diagram	 	

Although all three services are based on a circulation system, what differentiates the last from the rest are the social and cultural contexts. In Korea, franchise cafés have flourished in the take-out culture, thereby making people more tolerant of disposable cups. Yet, Europe has a long history of salon culture, involving drinking tea and coffee from reusable cups; therefore, using disposables in cafés has rather a short history, and people are more adaptable to using shared cups than Korea. Because of this difference, campaign plays a major role in the Bottle Factory model. Many previous pro-environmental campaigns failed because they were too detailed for people to pay attentions. Thus, to motivate people to always choose reusable cups, such campaigns must incorporate action-inducing incentives designed in the environment.

3. 2. A Study on the Korean Café Culture and Environmental Consciousness regarding Using Disposables

There is no guarantee that a cup-sharing service model that was successful in Europe will be well-accepted in Korea. Thus, the study model is built on reflections of the relevant cultural, social, and environmental differences; as such, we browsed online news and conducted in-depth interviews regarding the café environment in Korea and people's awareness of disposable cups. Since the opening of the first Starbucks in Korea in 1999, people have increasingly used disposable 'take-out cups.' According to the Ministry of Environment, disposable cup consumption rate increased to 66.5% in 2016 compared to 2008, when the cup deposit system disappeared. This period also coincided with an explosive increase in large franchise coffee shops, which means that local café-goers have been receiving drinks in disposable cups for nearly two decades.

For this study, online news articles from April 1 to June 12, 2018 were searched using two keywords: 'disposable cup' and 'take-out cup.' Out of 161 articles, 22 were field reports on how cafés and café-goers are reacting to the issue. The article 'A society addicted to disposable cups' in Korea Joongang Daily has the highest number of views, and received 1,211 comments and 473 likes. The comments demonstrated the differences of opinions among café-goers, owners, and staff members regarding the restriction of disposable plastic cups. However, it was difficult to place responsibility on any particular party for the increased consumption of disposables. In the article, café owners stated, "It is inevitable that cafés provide disposable cups to meet the needs." Further, two staff members interviewed on June 8, 2018 claimed that it was unrealistic for them to use reusable cups, because they are responsible for several other tasks such as preparing food and drinks and cleaning the tables. Moreover, the owners negatively perceived café-goers who brought their own tumblers or asked for mugs because of the extra work required to wash them. Meanwhile, three café-goers interviewed on June

11 said they do not use reusables because of the dominant social trend of using disposables for convenience. In sum, each party chose the most convenient option for themselves. Such choices reflect a social trend that has become a controlling factor that influences future actions.

4. The 0U Cup

4. 1. The Five Design Strategies

The five design strategies of the model were derived from behavioral model theories, case studies, and interviews (Figure 2).

First is 'circulation.' As shown in Figure 3, a participant receives a shared cup from a café. He/she uses it, and afterward, places it in a return box. The cup is then collected by the service provider for washing and sanitation and finally returned to the store. This service is well suited for colleges or offices, wherein both the customers and service providers are community members. Customers can easily choose an ecological behavior by using the 0U Cup service, freeing them from the hassle of carrying and washing their own cups.

Second is 'familiarity.' The model should allow café staff to naturally accept the new work process. Thus, the 0U Cup system should replace the existing condition in the use of space and movement around the café's countertop area. Washing services should be outsourced so that the staff is relieved of the extra workload.

Third is 'trust.' Participants should be informed that the cups are thoroughly and professionally washed before delivery to the next user to alleviate fears regarding hygiene. Visual elements and other design applications will support this service process. Trust must be continuously built.

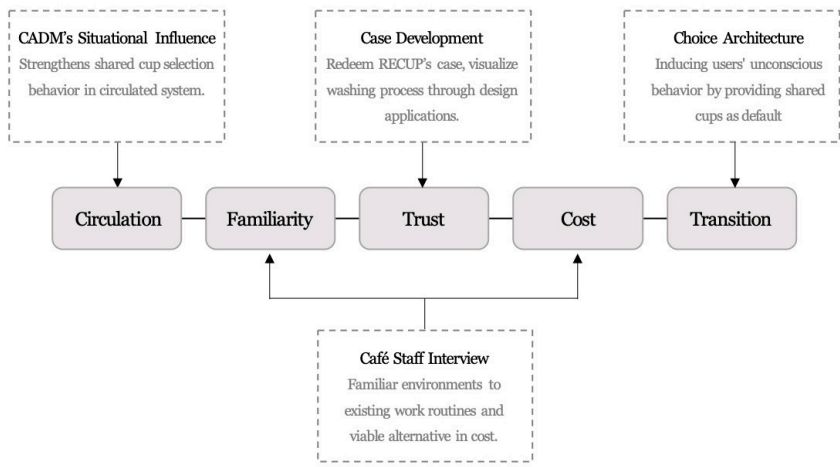


Figure 2 The Five Design Strategies

Fourth is ‘cost.’ The current costs of the café should be accurately accounted for to ensure the experimental model is considered a viable alternative. If moving to the new service is too expensive, it would be difficult to be accepted.

Fifth is ‘transition’ of the default. This means that shared cups will become the standard and disposables will be the option.

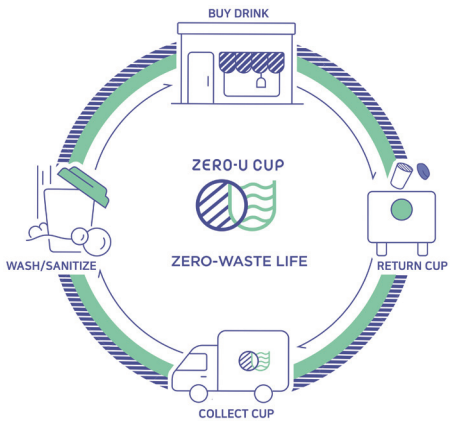


Figure 3 0U Cup Service Design Model

With this reversed transition of the default, participants will be driven to modify their ecological behavior, either consciously or otherwise.

Figure 4 Circular System of 0U CUP Service Design Model

Integrating these strategies, the 0U Cup service could become an accessible solution to those who routinely consume disposable cups. In Figure 4, the service flow is the same as before with disposable cups. After consumption, people place the cups in the return box instead of in the trash can. Here, ‘familiarity’ and ‘transition’ require actions. The ‘trust’ in the service is built through continuous exposure to systematic movements of uniformed workers collecting

cups from the boxes across campus. To enhance trust regarding the cups' cleanness, they are delivered in transparent boxes. Furthermore, neither the café nor customers need to pay additional costs. As such, the new service does face less objections related to the service flow. All design-related works, including brand identity (BI) and product applications, communicate these strategic details to participants.

4. 2. Design Applications

0U can be read as 'gong-u,' meaning 'shared' in Korean, and 'zero-u,' referring to a zero-waste lifestyle. The name highlights that the service aims to leave no negative ecological footprint. The first design application is the cup itself, on which legible images and phrases are printed: *"This 0U Cup is the property of HCID Lab* (the name of the lab that conducted the study) *and Neutinamu College of Music Branch* (the experimental site)*"* and *"Please return the used cup to the return box. It will be reused after washing and sanitization"* (Figure 5). Second is the return box that encourages participants to voluntarily bring in the cups. Figure 6 shows a simple ballot board to choose between two options (rice or bread), which was placed above the return box to engage participants. The box arrangement of the inlets was designed to segregate the remaining beverage and lid from the body for disposal.

Figure 5 Message on 0U Cup

Figure 6 Ballot Board and the Return Box

5. The Pilot Experiment

The model's scheme was tested in a campus café located in Seoul, Korea for four days, from August 6 to 9, 2018. Five return boxes were installed in different buildings around the campus based on the café-goers' routes, the information for which was obtained through preliminary observation and a questionnaire survey. A temporary cup-washing facility was stationed a 5–10-minute walk away from the café; further, campus cleaners were temporarily hired for washing the cups, while two students for collecting and delivering them.

5. 1. Site Analysis

An hour-long in-depth interviews with two managers working at different campus cafés were conducted on May 9 and June 9, 2018. Both cafés had previously used only disposable cups. First, having to wash dirty cups when they are understaffed was not their option. The chosen café sells an average of 700 drinks per day during the academic semester, and 200 drinks during vacations, and are always understaffed. The managers assumed that students would

be dissatisfied with a longer wait due to cup-washing when they have only 5-10 minutes break. Second, managers strongly believed a change in café policies is less critical than that of customer interest in using reusable cups. Accordingly, we sensed staff members' negative attitude toward the change as a stumbling block in reducing disposable cup waste. As a result, the practical conditions were determined and modified for the experiment based on the interviews.

5. 2. Application

Posters were hung throughout the campus as well as in the café a week before the experiment to introduce the pilot service and highlight the severity of excessive consumption of disposable cups in everyday life. To attract the attention of café visitors, 32 0U cups were displayed representing brand color scheme (Figure 7). Additionally, the posters and return box were placed nearby so that the service and its key messages were visible at one glance. Paper straws and reusable handkerchiefs were imprinted with the service's circular diagram (Figure 3) and placed on the countertop. The handkerchiefs were replacements for leaflets, although, they failed to capture the students' attention. In fact, some students asked if they were disposable. The instance showed people's extent of habituation to disposables.

Figure 7 0U Cup Café Display

5. 3. Result

The experiment attempted to answer the following questions:

1) How can we motivate people to not use disposable cups?
2) How can we maintain a low loss rate of the cups?
3) What are the benefits of providing an efficient washing service for cups?

The average return rate of cups was 74.89% (Table 2); the return box inside the café collected considerably more cups than those across the campus. People were conscious of others' behavior in the café, and were unaware of the other boxes' locations. The results showed that even without imposing the requirement of the cup deposit (e.g., RECUP, Cupclub™), a high return rate can be ensured by making shared cups the 'default' and designing action-inducing incentives in the environment, as described above.

Table 2 Return rate of 0U cups

Date	Return/Consumption	Return rate(%)
Monday, August 6, 2018	105/174	60.34
Tuesday, August 7, 2018	113/150	75.33
Wednesday, August 8, 2018	142/170	83.52
Thursday, August 9, 2018	123/153	80.39

6. Conclusions and Discussion

This study has great significance as it implements a service design model that integrates product design solutions, eco-campaigns, and related policies to address disposable cup waste. Based on five design strategies, the 0U Cup was developed and verified through an experiment on its self-sustainability and action-inducing incentives designed in the environment. Although the 0U Cup may look similar to RECUP and CupClub™, the present model is unique as it proposes five strategies that reflect the socio-cultural environment of Korea, considers community members to be at the core of the model's self-sustainability, and discovered CADM's *situational influences* and, choice architecture's 'default option' and 'bandwagon effect' as a theoretical framework to cope with people's habitual behavior for changing their instant choices. Based on these theoretical grounds, the transitions in the model became an acceptable solution for café owners and -goers', instead of a novel but unacceptable approach. Hence, this experiment provides an ecological and sustainable strategy for the café industry to minimize waste.

As seen in Figure 8, students are the primary users of the service, but may also be the service providers, which may reduce the time and cost. Therefore, students and workers (e.g., campus cleaners) could be used interchangeably to support the circulation, thereby resulting in a self-sustaining service.

In future experiments, the service should be elaborated while considering not only the supply and demand of individuals within the campus but also the operational costs and location of supporting facilities. From the experiment, it was observed that about 100 cups can be manually washed by three workers in two hours; if the process can be done automatically, the time will be reduced. Furthermore, some cups were damaged or became discolored as the polystyrene (PS) used was weak. Therefore, the cup material should be modified to be more durable and resistant to discoloration without releasing harmful substances when exposed to hot temperatures.

For further development, there are some areas that need to be addressed. First, the current model may result in a lower cup return rate when applied over a longer period than in this study. Apart from increasing the number of return boxes for service accessibility, further examination of other action-inducing incentives in behavioral psychology and economics should be conducted. Second, the proposed model mainly focused on 'circulation,' 'transition,' and 'familiarity' among the five strategies. More considerations on building 'trust' and

addressing 'cost' issues are requisite. Strong relationships among stakeholders can help mitigate these challenges, so that both ethical and business values are created.

People hardly change their behavior unless their situations, environments, or conditions change. When individuals make choices without regarding their *situational influences*, the choices cannot be sustained over a long period. This is what the present study attempted to verify through the oU Cup model experiment.

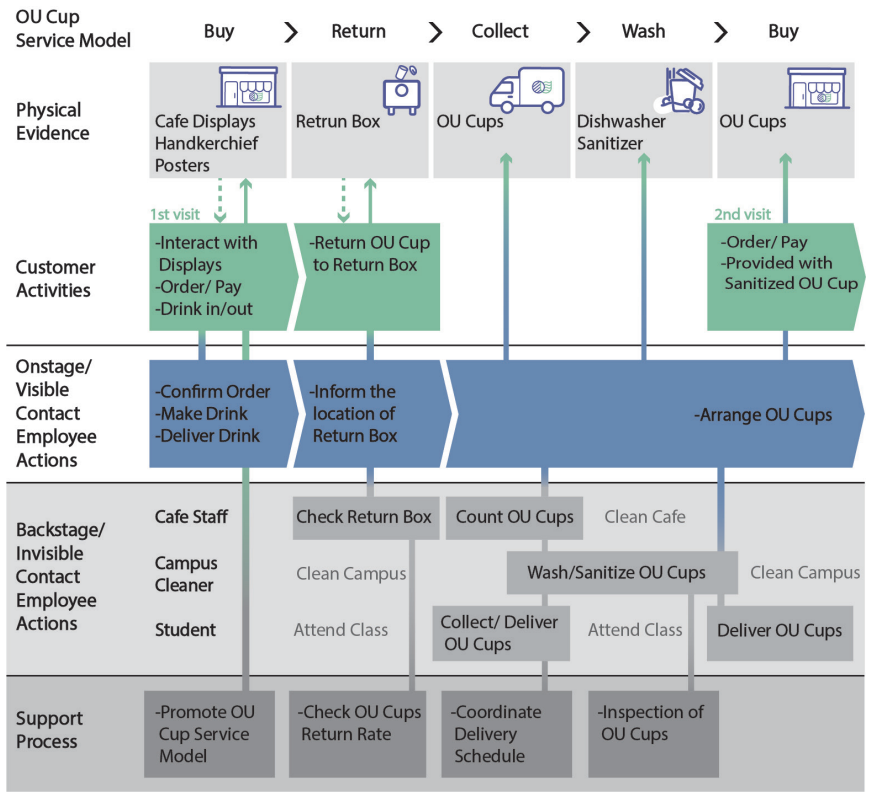


Figure 8 0U Cup Service Blueprint

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