Article

Exploring and Addressing the User Acceptance Issues Embedded in the Adoption of Reusable Packaging Systems

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Abstract: Plastic in the linear consumption model is frequently manufactured and disposed of, leading to the creation of excessive plastic waste, which has significant consequences for the environment. Single-use food packaging waste is a large constituent of plastic waste that needs to be addressed urgently. The implementation of reusable packaging systems (RPSs) to close the loop of consumption appears to be promising, but the insights into consumers' willingness to accept them are limited. This research investigates the aspect of consumers' adoption of RPSs by identifying the particular user acceptance issues and eventually providing a set of design recommendations to address them. The data collection methods are remote interviews, engaging with 42 participants in three iterations, to evaluate three user experiences of RPSs in order to identify the user acceptance issues. After the user acceptance issues are identified in each iteration, the Theory of Attitude-Behaviour-Context is employed to advance the understanding of the acceptance issues. In order to continuously refine the user experiences, insights from design for sustainable behaviour are applied to address the user acceptance issues. The research results include three refined user experiences, four user acceptance issues—namely hygiene, usability, finance and motivation—and design recommendations to address those user acceptance issues. This research may be of interest to packaging professionals, and could be used to design and refine the RPSs to induce consumers' adoption.

Keywords: single-use food packaging waste; reusable packaging systems (RPSs); user acceptance issue; iteration; theory of attitude-behaviour-context; design for sustainable behaviour

1. Introduction

The production of plastic has increased dramatically during the last few decades. The linear consumption model combined with ineffective waste management approaches has led to excessive plastic waste ending up in nature, causing significant environmental consequences. For instance, there could be an estimated total of 250,000 tonnes of plastic in the ocean, which imperils the marine ecosystem (e.g., it causes damage the biodiversity in the ocean) [1].

Recently, with the impacts of COVID-19, the plastic waste issues became more prominent, because the usage of single-use products such as plastic gloves increased for hygienic purposes. For instance, Peng et al. [2] argued that around 8.4 ± 1.4 million tonnes of pandemic-associated plastic waste have been generated since the outbreak of COVID-19. Laville [3] also reported that the extra plastic waste from COVID-19 weighs 25,900 tonnes, and that it has leaked into the ocean. Amid the global plastic waste, Geyer et al. [4] identified that the primary packaging (the packaging that is in direct contact with the actual products) from the food sectors is the largest constituent; therefore, addressing primary packaging waste is key to effectively solving this plastic waste issue. However, eliminating primary packaging waste is challenging, as no alternatives can be found to replace the roles that packaging plays in protecting, preserving, containing and marketing the products [5].

The responsibility of eliminating the packaging waste should be placed on the business sectors, which are responsible for the development of packaging solutions [6,7]. In recent years, the business sectors provided some technical solutions (e.g., biodegradable materials or enhanced recycling procedures) [8]. However, Löhr et al. [9] argue that these solutions may not effectively address the plastic issues because of the lack of integration of various societal actors.

What would be an effective approach to address plastic packaging waste? Williams and Helm [10] and the Ellen MacArthur Foundation [11] highlight that reuse should be proposed ahead of technical solutions (e.g., recycling, incineration or resource recovery), inferring that implementing the RPSs would be promising and effective. However, the wide implementation of RPSs encounters barriers, one of which is the lack of consideration of consumers' adoption [12–15]. Although some studies related to consumers' adoption of RPSs can be identified, these studies provide fragmented knowledge. For instance, van der Laan and Aurisicchio [16] focused on fast-moving consumer goods in order to understand consumers' reuse behaviour, and identified four archetypal behaviours. However, their research provides limited insights on how to encourage consumers to perform these four archetypal behaviours. Kunamaneni et al. [17] investigated the gap between attitude and behaviour regarding the reuse of household care products. Although their research offers four guidelines for designing products that consumers are willing to reuse, these guidelines are generic, and are only limited to household products. Bashir et al. [18] conducted research based on consumers' aspects in order to refine five refill-based solutions by applying tailored information-based strategies. Their research offers knowledge on how information-based strategies can be applied in order to improve consumers' adoption. However, the use context—which is also an important factor in consumers' adoption—is not extensively analysed. Greenwood et al. [13] studied consumers' engagement with food reusable packaging products and identified 13 types of packaging that consumers are more inclined to reuse. However, an explanation of how these 13 types of packaging can be applied to improve consumers' adoption is needed.

Based on the above arguments, this research identifies a knowledge gap, i.e., the lack of knowledge of how to improve consumers' adoption of RPSs to address the plastic issues. In order to fulfill this knowledge gap, this research addresses two research questions:

I.   What are the user acceptance issues affecting consumers' adoption of RPSs?
II. What design recommendations can be made to support packaging professionals in addressing the user acceptance issues?

This research adopts an exploratory approach to iteratively evaluate the user experiences of three RPS cases. The research outcomes advance the knowledge of how to improve consumers' adoption of RPSs. The remainder of this paper is structured as follows: Section 2 offers a theoretical foundation. Section 3 outlines the research methodology. Section 4 presents the overview of the results, the identification of the user acceptance issues, and the analysis of user acceptance issues. Section 5 discusses the outcomes. Section 6 outlines the research limitations, and Section 7 concludes this research by highlighting the research contribution and the future studies.

2. Theoretical Foundation

For the analysis of the adoption of RPSs, we reviewed six highly cited behaviour theories in order to understand the pro-environmental behaviour, namely Persuasion Theory (PT), the Theory of Planned Behaviour (TPB), the Theory of Reasoned Action (TRA), the Theory of Norm Activation (TNA), the Theory of Value-Belief-Norm (TVBN), and the Theory of Attitude-Behaviour-Context (TABC). Among these theories, TABC was chosen for the analysis of the adoption of RPSs. TABC (Figure 1) argues that pro-environmental behaviour is a complex and interactive product of internal/attitudinal factors (e.g., personal beliefs, norms and values) and external/contextual factors (e.g., social norms, monetary incentives, and costs) [19]. The strength of this theory is in explaining the behaviour by focusing on the structural interaction or dynamics between the influence of the attitudinal

and contextual factors. In particular, this theory claims that when the role that contextual factors play is weak or non-existent, the attitude–behaviour link is strong. On the other hand, when the contextual factors exert a strong influence, the attitude–behaviour link is weak or non-existent [19–21]. In a real situation, desired behaviours are likely to be performed when consumers have a positive attitude towards that behaviour and contextual factors facilitate consumers in the performance of that behaviour [22]. This also suggests that the behaviour could be temporal, as the contextual factors may be changed in different locations and at different times [21,22]. TABC was adopted because the application of TABC can enable this research to focus on the contextual factors, which should be important aspects of user experience. However, the identification of the attitudinal and contextual factors that are relevant to the adoption of RPSs would be required. The following text aims to describe the identification of attitudinal and contextual factors by analysing the other five theories, as well as the use phase of RPSs.
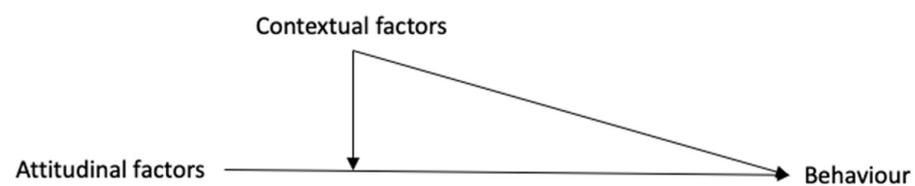

Figure 1. The Theory of Attitude-Behaviour-Context [19].

2.1. Identification of the Attitudinal Factors

This section describes the identification of the attitudinal factors. The outcomes of reviewing the five theories lead to the identification of the attitudinal factors, which are knowledge, attitude and value. These three factors are important because influencing these three factors should theoretically trigger a behaviour change. Table 1 illustrates the behaviour change models and the attitudinal factors.

2.2. Identification of the Contextual Factors

The exploration of the contextual factors needs to be contextualized in the RPSs. Considering that this research explores consumers' interactions with the physical artefacts in order to receive the offers of RPSs, the product/service and facilities are therefore relevant and can be defined as contextual factors. To clarify, the product refers to the packaging itself, as the actual content of the product was out of the scope of this research. The service refers to the action offered by the business to extend the lifespan of the packaging (e.g., delivery, collection, washing). Because nowadays products and services are always intertwined, it would be better for individuals to evaluate products and services combined together. Therefore, the product and service could be combined as one contextual factor. The facility refers to the contextual equipment (e.g., refill dispensers or empty packaging collection machines) that delivers the offers. Based on the analysis above, knowledge, attitude, and value can be classified as attitudinal factors, and product/service and facilities are defined as contextual factors. The adapted TABC is illustrated in Figure 2.
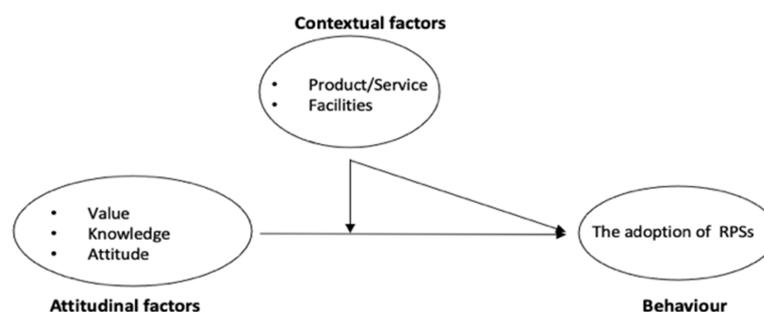
Figure 2. The adapted Theory of Attitude-Behaviour-Context [19].

Table 1. The behaviour change models and key attitudinal factors.

Theory	Definition	Limitation	Attitudinal Factor
Persuasion Theory	Behaviour change is realised through the provision of the required information, which influences consumers' knowledge, awareness of the consequences and attitudes [23].	- too deterministic to assume the power of information provision [21,24]. - people can still act accordingly without necessarily assimilating the "persuasive message" [21,24].	Knowledge—an individual's own understanding of a subject [24,25].
Theory of Reasoned action	Behaviour change is influenced by the intention, moderated by attitude and subjective norm [26].	- fails to address consumers' volitional control over a decision-making situation [25]. - the strong link between attitude and behaviour is speculated but unsupported by empirical studies in pro-environmental behaviour context [27].	Attitude—the degree to which a person has a favourable or unfavourable belief or evaluation of a given behaviour [26,28]. (Subjective norm and Perceived behaviour control are out of the scope of this research because it is impossible to evaluate them in a virtual evaluation)
Theory of Planned behaviour	Behaviour change is influenced by the intention, which is moderated by the attitude, subjective norm and perceived behaviour control [28].	- overstates the position of intention without sufficient validation of empirical data [25,29]. - neglects the situational factors to explain the consumers' behaviour [30]. - fails to explicitly explain the consumer's decision-making process regarding purchasing [31].	
Theory of Norm Activation	Behaviour change is only influenced by the personal norm, which is defined as the feelings of moral obligation that individuals have to adopt the particular behaviour [24,32].	- unspecifies how personal norms are disestablished from social fabric and how to drive personal norms to manifest the behaviour change [33].	Value—something that individuals consider important [34].
Theory of Value-Norm-Belief	Behaviour change is triggered once the value influences the belief, which subsequently affects personal norms, the only behaviour factor determines the behaviour change [24,34].	- neglects the contextual factors which can also facilitate or hinder the behaviour.	

2.3. Behaviour Change Strategies

This section presents the behaviour change strategies based on the insights from Design for Sustainable Behaviour (DfSB) literature. Steg and Vlek [35] identified two types of strategies, namely informational strategies and structural strategies. Both strategies can be applied in order to influence attitudinal and contextual factors. The application of the informational strategies changes consumers' attitudinal factors (e.g., attitude, perception, cognition and norms), which creates a desire to perform the behaviour through persuasion. An effective persuasion needs to show the credibility of the information sources in order to increase the trust of the message, tailor the message to highlight the benefits of the behaviour, and pinpoint how to overcome the obstacles that prevent people from changing the behaviour [25,36].

The application of the structural strategies helps consumers to perform the behaviour by altering the contextual factors (e.g., facilities, policies and price). The main principle of applying the structural strategies is to demonstrate the benefits of the behaviour change, such as convenience (e.g., the improvement of the availability of the products or services providers helps consumers to access the products/services providers easily). Alternatively, rewarding desired behaviour is also an effective approach [37,38]. The rewards are classified as financial and non-financial. Financial rewards are always self-evident; however, they need to reach a certain threshold in order to trigger the behaviour change [34,39]. Non-financial rewards refer to intangible benefits, such as convenience, a sense of achievement, or emotional satisfaction [34,39,40]. In relation to the elaboration of the structural strategies, Lilley [41] developed eco-feedback, behaviour steering and persuasive technology to direct, maintain and ensure the behaviour change. Eco-feedback directs behaviour change by providing tangible, auditory and visual information which reminds consumers of their consumption of the resources. Behaviour steering triggers the behaviour change by promoting the benefits or constraints. Persuasive technology ensures the behaviour change by altering consumers' mindsets.

Tang and Bhamra [42] and Bhamra et al. [43] built upon Lilley's work, and created seven behaviour change strategies: eco-information (informing the consumption of the resources by making it visible, understandable and accessible for consumers, reflecting their consumption behaviour); eco-choice (providing consumers with sustainable options to encourage them to consider their use behaviour); eco-feedback (informing consumers and helping them to socially and environmentally consider their behaviour through real-time feedback); eco-spur (rewarding desired behaviour and punishing undesired behaviour); eco-steer (restraining the consumers in a planned action); eco-technology (using advanced technology to shape consumers' behaviour in a planned way); and clever design (producing automatic behaviour change through innovative product design).

In contrast to the strategies mentioned above, Lockton et al. [44] proposed a framework containing six sets of strategies or lenses, which are: the architectural lens (changing the layout of a product or service system to influence consumers' behaviour); the error proofing lens (treating the behaviour that deviated from the desired behaviour as an error); the persuasive lens (employing digital interface to convey information to persuade consumers); the visual lens (using shape, sounds, textures and so on to influence consumers' behaviour); the security lens (counter-measures to deter or prevent the undesired behaviour); and the cognitive lens (influencing consumers' decision-making process in order to develop the targeted behaviour).

Moreover, De Medeiros et al. [45] performed a study to evaluate similarities among these aforementioned strategies. Accordingly, the framework was developed to support the process of applying the behaviour change strategies to influence attitudinal and contextual factors. Because the strategies from Steg and Vlek [35] are explicitly related to attitudinal factors and contextual factors, their strategies can be also incorporated into the framework. Table 2 shows the adapted framework, which offers the guidelines for the application of behaviour change strategies to influence attitudinal and contextual factors.

Table 2. The adaption of the behaviour change framework [45].

Behaviour Factors	Aim of Applying the Strategies	Steg and Vlek [35]	Lilley [41]; Tang and Bhamra [42]	Lockton et al. [44]
Attitudinal factors	Increasing the desire	Informational strategies	Eco-information/Eco-choice/Eco-feedback	Cognitive/Error-proofing/Persuasive/Visual Security
Attitudinal/contextual factors	Increasing the desire/Reduce the difficulties	Informational strategies/structural strategies	Eco-spur/Eco-steer	Architectural/Error-proofing/Persuasive/Visual/Security
Contextual factors	Reduce the difficulties	Structural strategies	Eco-technology/Clever Design	Architectural/Error-proofing/Security

3. Research Methodology

The purpose of the research is to investigate the issues affecting consumers' adoption of RPSs. To this end, an inductive approach was employed to develop theories based on the collected data. This research was focused on three RPS cases (Case 1, Case 2 and Case 3) that require consumers to return the empty packaging, which should significantly challenge user acceptance. The current packaging consumption is based on a linear pattern (purchase, use, disposal), and packaging solutions requiring consumers to return the empty packaging should challenge consumers significantly. Therefore, focusing on this type of RPS cases should generate insights to address the knowledge gap. Case 1, Case 2 and Case 3 were selected because all of them would require consumers to return the empty packaging. Notably, these three cases are examples of three different reusable packaging archetypal models ('archetypal model' refers to a group of businesses sharing similar characteristics). Long et al [46] identified 15 archetypal models based on the characteristics (i.e., ownership of the packaging, service types, service locations, target groups and delivery methods). These 15 archetypal models represent all of the variations of RPSs in the market until 2020. It has to be underlined that businesses within same archetypal models may be also different, as identified by Long et al. [46]. These three archetypal models are part of a framework that includes a total of 15 archetypal models, and the insights of this research may only be generalised to those three archetypal models. Table 3 provides the description of these three cases.

Triangulation, which refers to the use of multiple methods to collect data related to the same phenomenon, was adopted in order to enhance the credibility and validity of the collected data [47]. This method helps to ensure that biases arising from the use of a single source are overcome. The data from each case were collected from the company website and two online media articles. First, company websites were visited and relevant information was collected from these websites, including the steps of the user journey, the ownership of the packaging, and the usage scenario. Then, data about the same topics were collected from media articles online. Finally, data from these different resources were compared in order to confirm and support the findings.

Table 4 illustrates the procedures of the research activities, and the following paragraphs describe the procedures.

Because this research would involve human participants, ethics approval prior to the data collection was required (Step 1). The Brunel Ethics Committee initially approved this research in February 2020, and additional amendments were subsequently made in March 2020 due to the outbreak of COVID-19. Finally, the data collection was performed by the first author online between April 2020 to July 2020. Prior to the data collection, the research methods were piloted by inviting three Brunel doctoral researchers to pre-test the visualised user experiences and questionnaires (Step 1). These three participants were asked to identify any issues in relation to the clarity of the visualisations and the clearness of the questions. The participants were asked two questions, which were: I. Do you think

that these storyboards are easy to understand? II. Do you think that these questions are clear and easy to understand? All of them confirmed that the visualisations and questions were clear and easy to understand. As a result, these visualisations and questions can be considered valid and reliable.

Because the UK is one of the countries generating the largest amount of packaging waste per person, and because people in the UK aged 25–44 are the segment that generates the most plastic waste [48], the research targeted participants in the UK within that age group (Step 1). The messages about the participant recruitment were posted on social media sites such as Facebook and Twitter. The convenience sampling strategy was adopted in order to recruit participants: individuals who fitted the selection criteria and responded positively to the researcher's posts on social media were invited (e.g., if a person said that he/she felt interested in participating in this research activities, the first author would approach and provide more details about the research purpose, the expectation from the participants, and the research activities, and invite them to participate).

The research protocol was followed in accordance with requirements of the Brunel Ethics Committee (Step 2). Then, the storyboard was explained to the participants (Step 3). Regarding the data collection methods, a semi-structured interview was adopted (Step 4) because it is widely used to gain in-depth information about a complex issue, and to allow new questions into the dialogue [49,50]. The duration of the research activities in each evaluation was controlled to around 30–45 min. In terms of the sample size, the principle of theoretical saturation was used. Theoretical saturation refers to a continuous data collection process until no new information emerges [51–53]. Theoretical saturation is also known to be sufficiently achieved between 10 and 15 participants [54]. To clarify, in the first evaluation, the first author initially interviewed 10 participants. Because each participant had produced sufficient data (e.g., all of the participants argued that the return of the empty packaging was an issue), the first author interviewed another 2 participants in order to achieve theoretical saturation. In the second and third evaluation, the first author still initially interviewed 10 participants. Considering that, the user experience was refined, and the participants identified fewer user acceptance issues. The first author interviewed another 5 participants in order to ensure that theoretical saturation was achieved.

Table 3. The description of these three cases.

Business	Description
Case 1	This business is an innovative grocery store offering food products through automated dispensers. Case 1 sells liquid products such as oil and wine. Consumers can rent Case 1's bottles for containing the products. Consumers need to operate the automated dispensers by selecting the amounts and product categories to have the products. When checking out, consumers pay extra deposits for using bottles besides payment of the actual products. When consumers finish the products, they can visit stores to return the empty bottles for a deposit refund.
Case 2	This business collaborates with food providers to offer food in reusable takeaway packaging to consumers on-the-go. Consumers need to firstly download Case 2's mobile app, create an account and pay either monthly or annually for the subscription of the services. Consumers can use the mobile app to find the list of the collaborated food providers and locations. Upon arriving at the place, consumers need to find the verification codes to enter in the app. Afterward, consumers can make the payment for ordering their food and leave the place. When consumers finished the food, they need to return the empty packaging to the drop-off locations within a given time, otherwise, the business would press a financial surcharge on them. If consumers want to cancel their subscription plan, they need to email Case 2 to explain that they want to cancel the subscription.
Case 3	This business collaborates with the beverage providers to offer drinks in reusable cups to consumers on-the-go. Consumers need to firstly download the app and register their payment methods (No charge at this stage). Consumers can use the app to find the list of the collaborated providers and locations. Arriving at the place, consumers need to scan the QR code from the app and subsequently pay and order their drinking. When consumers finish the drink, they need to visit a designated location for returning the cups within a given time. If consumers do not return the cup on time, Case 3 will financially charge them.

Table 4. The procedures of the research activities.

Step	Research Activities	Details of the Research Activities
Step 1	Research preparation	The research preparation included activities such as obtainment of ethics approval, selection and visualisation of cases (The visualisation of the cases was achieved via storyboard, which refers to the sequences of illustrations about service touchpoints), development of questionnaires, pre-test the research methods, and identification and recruitment of target participants.
Step 2	Research protocol	Before the beginning of each interview, the research protocol, including the research purpose, research ethics, and the research process, was sent to inform the participants.
Step 3	First evaluation—explaining the storyboards	The visualised user experiences (Appendix A) were shown to participants, who were given a few minutes to learn how each user experience worked. Subsequently, the researcher explained each service touchpoint to ensure participants fully understood.
Step 4	First evaluation—participants' evaluation	Participants were interviewed individually, and two tasks were given to participants. First, participants were asked to rate the level of their user acceptance [Strongly unacceptable (1 point), unacceptable (2 points), neutral (3 points), acceptable (4 points), and strongly acceptable (5 points)] for each case. Second, participants were asked three questions one by one: I. Which service touchpoint(s) can you not accept? II. Why are you not able to accept the service touchpoint(s)? III. What are some overall opinions you can give to each case?
Step 5	Analysis of the first evaluation	The data was collected by voice record and transcribed, and thematic analysis was used to evaluate the patterns of meaning underlying the textual data that led to new themes' identification [42]. This process resulted in the identification of user acceptance issues, which included hygiene, usability, finance, and motivation.
Step 6	Adaption of Theory of Attitude-Behaviour-Context	In order to better understand the user acceptance issues, the adapted Theory of Attitude-Behaviour-Context was applied to allocate these four issues based on attitudinal and contextual factors. Consequently, the findings offered a better understanding of why participants could not accept these three cases.
Step 7	Application of the behaviour change strategies	The behaviour change strategies were applied to address these user acceptance issues and refine the user experience.
Step 8	Second and third evaluation	The same research process was applied to the second and third evaluation. Since this research implemented an iterative evaluation and refinement process, the refined user experiences were evaluated two more times with different groups of participants in three evaluations. The principle of theoretical saturation was applied. In total, this research recruited 12 participants for the first evaluation, 15 participants for the second, and 15 participants for the third.
Step 9	Developing the design recommendations	The discussion was encouraged not only to generalise the research results but also to suggest what design recommendations could be applied by packaging professionals to design RPSs.

Thematic analysis is a flexible approach to analysis, and it provides a rich and detailed account of the data [54–56]. The process of performing the thematic analysis followed the six phases introduced by Braun and Clarke [57]. To simplify, the relevant data were initially coded for the extraction of the meaning of the data, themes based on the set of similar codes were identified, and similar themes grouped under the same categorisation were defined as the user acceptance issues. In this way, it was possible to, for example, compare the frequency of the mentioned themes, identify theme occurrence, and graphically display relationships

between themes [50–52]. This process was carried out in order to analyse all of the data from the participants, leading to the identification of four user acceptance issues (Step 5).

After the user acceptance issues were identified, the analysis of these issues was performed by applying the adapted TABC in order to allocate these four user acceptance issues, resulting in a better understanding of the reasons why consumers cannot accept these RPSs (Step 6). Subsequently, behaviour change strategies were applied to address these issues (Step 7). As this research was iterative, the second and third evaluation followed the same procedure as the first evaluation (Step 8). Finally, design recommendations were developed based on the insights arising from these three evaluations (Step 9).

4. Results

This section provides an overview of the results of the three rounds of user acceptance evaluation, and analyses the identified user acceptance issues.

4.1. Overview of the Results

Table 5 showcases the data in relation to the user acceptance ratings of the three rounds of evaluations. The user acceptance ratings were incrementally improved in each phase of the evaluation, and all of the ratings reached the satisfactory level in the third evaluation, indicating that the application of the behaviour change strategies has allowed the researchers to address the user acceptance issues. It has to be underlined that although "4" was the threshold for consumers to accept, this may only be used as an indication, rather than confirmation that consumers can accept these three RPSs in practice, as this research didn't invite participants to evaluate these three RPSs in practice. Consequently, when the user acceptance ratings reached "4", it is suggested that consumers could theoretically accept these offers.

Table 5. User acceptance ratings for each case, and in each round of evaluation.

	Strongly Unacceptable (1)	Unacceptable (2)	Neutral (3)	Acceptable (4)	Strongly Acceptable (4)	Avg
First evaluation						
Case 1	1 (8.33%)	3 (25%)	7 (58.33%)	1 (8.33%)		2.67
Case 2	6 (50%)	4 (33.33%)	1 (8.33%)	1 (8.33%)		1.75
Case 3	1 (8.33%)	8 (66.67%)	2 (16.66%)	1 (8.33%)		2.25
Second evaluation						
Case 1		1 (6.67%)	4 (26.67%)	8 (53.33%)	2 (13.33%)	3.73
Case 2	1 (6.67%)	4 (26.67%)	3 (20.00%)	6 (40.00%)	1 (6.67%)	3.13
Case 3		1 (6.67%)	2 (13.33%)	5 (33.33%)	7 (46.67%)	4.20
Third evaluation						
Case 1		1 (6.67%)	2 (13.33%)	6 (40.00%)	6 (40.00%)	4.13
Case 2		2 (13.33%)	1 (6.67%)	6 (40.00%)	6 (40.00%)	4.07
Case 3			2 (13.33%)	7 (46.67%)	6 (40.00%)	4.27

4.2. Identification of User Acceptance Issues

The performance of the thematic analysis led to the identification of four major user acceptance issues, and the codes used in the thematic analysis can be found in Appendix B. Table 6 shows the prevalence of the four major issues among the participants in these three evaluations, and the description of each issue is given below.

Table 6. The prevalence of the four major issues among the participants in these three evaluations.

	Hygiene	Usability	Finance	Motivation
First evaluation (12 participants)				
Case 1	4	10	3	N/A
Case 2	3	12	7	6
Case 3	4	10	5	N/A
Second evaluation (15 participants)				
Case 1	10	4	N/A	3
Case 2	4	6	7	7
Case 3	1	2	1	2
Third evaluation (15 participants)				
Case 1	3	3	N/A	N/A
Case 2	3	2	2	N/A
Case 3	3	1	1	N/A

Hygiene refers to how consumers perceive the hygiene standard of the RPSs. It could be that either consumers consider the offers to be unhygienic, or the offers themselves present hygiene issues. Although hygiene may not be the most frequently mentioned issue, it may be significantly critical. As food products are directly related to human health and safety, it could be inferred that few people would comprise hygiene standards to accept the RPSs.

Usability refers to issues affecting the degree to which the RPSs are easy to use. Consumers usually prefer the offers that are convenient and easy to use, and it can be difficult to dissuade them from this preference. Therefore, this issue may be inevitable, as consumers have to carry out extra activities in order to adopt RPSs. During these three evaluations, the participants commented either that, overall, the offer may have usability issues, or that a specific touchpoint may have a usability issue.

Motivation refers to the specific reasons for consumers to adopt RPSs. In order to change a consumption pattern, consumers must realise benefits from this behaviour change; otherwise, consumers could wonder why they should change their behaviour, if their current consumption pattern is satisfactory.

Finance refers to issues related to payment options (e.g., purchasing and refunding). Most issues related to finance can be regarded as financial risk, and in addition, individuals may have particular preferences related to these financial payment options. Because these RPSs are novel offers with which consumers may be unfamiliar, they may be financially vigilant, as they may perceive the new RPSs as trying to induce them to pay more.

4.3. Addressing the User Acceptance Issues

This section illustrates the application of behaviour change strategies to address the user acceptance issues. First, the adapted TABC was applied in order to allocate these four user acceptance issues (identified in Section 4.2) according to the definitions of the attitudinal and contextual factors. For instance, regarding hygiene issues, some data indicate that participants may have inaccurate knowledge of how the packaging is washed, resulting in the objection to the reusable packaging solutions. Therefore, this issue can be allocated to the attitudinal factor of knowledge. However, other participants may perceive the facilities (e.g., dispenser) as unhygienic, and thus this issue can be allocated onto contextual factor of the facility. Figure 3 shows the allocation of these issues from three evaluations onto the adapted TABC. To clarify, Case 1, Case 2 and Case 3 are represented by C^1, C^2 and C^3. The number in the parentheses refers to the number of participants arguing this issue. The issues of hygiene, finance, motivation and usability are represented by H, F, M, U. The attitudinal (i.e., attitude, value and motivation) and contextual factors (i.e., facility and product/service) are represented

by A, V, K, F and P, accordingly. For instance, C^1H^K (2) refers to two participants arguing that Case 1 has hygienic issues (knowledge factor).
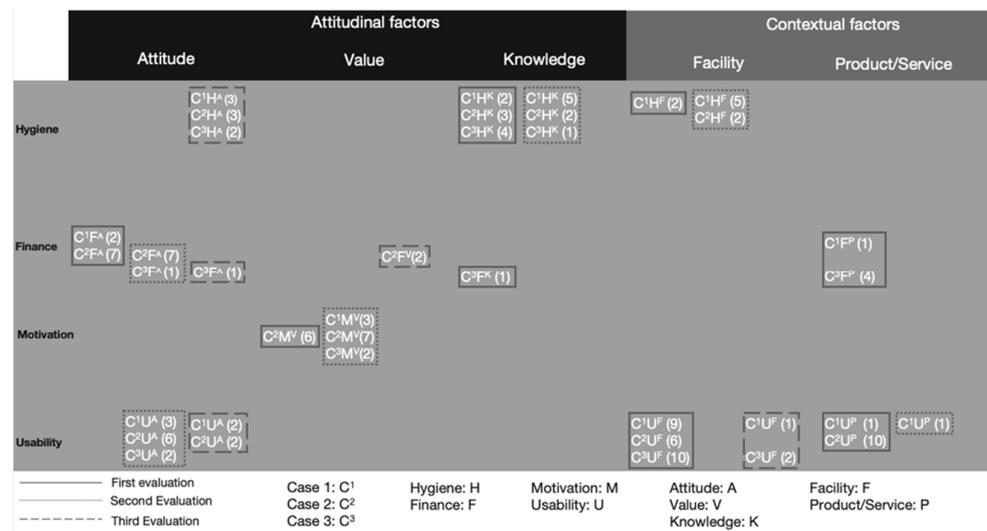
Figure 3. Mapping of the identified issues considering the adapted Theory of Attitude-Behaviour-Context.

After the mapping process, the adapted behaviour change framework helped us in linking the behaviour change strategies to the attitudinal and contextual factors (see Figure 4). Then, we identified different behaviour change strategies corresponding to each user acceptance issue, and applied these strategies in order to address these issues. Tables 7 and 8 describe how different behaviour change strategies were applied in order to address the user acceptance issues after the first and second evaluation, respectively.
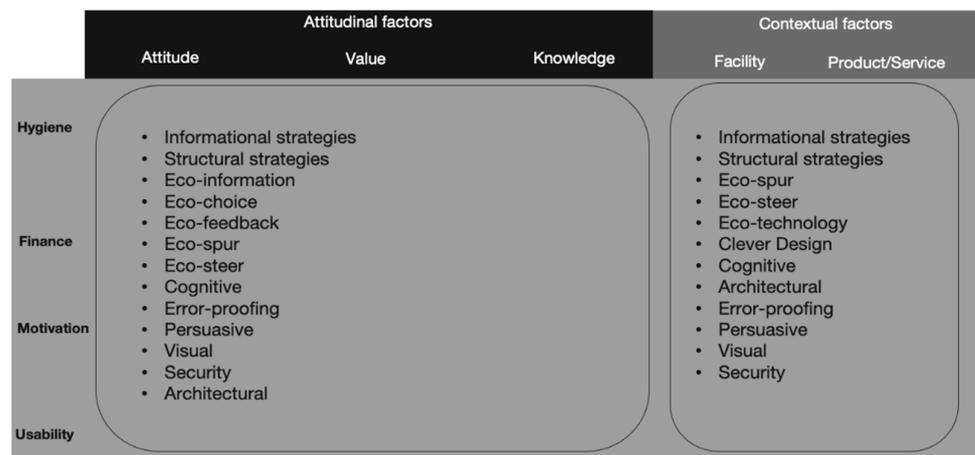
Figure 4. Behaviour change strategies grouped in relation to attitudinal and contextual factors.

Table 7. The behaviour change strategies used to address the user acceptance issues after the first evaluation.

Issues: Themes Are in the Backets and Codes Come after the Hyphen	Behaviour Change Strategies: Details of the Behaviour Change Strategies in the Brackets	Aim
C^1H^K/C^2H^K/C^3H^K: (*Consumers' perception of the hygiene/Consumers' biased of the hygiene of reusable packaging/Lack of the understanding of the washing process*)	1. Cognitive lens: C^1H^K(printing texts on the surface of the box to inform consumers that all bottles are sterilized and also to inform other consumers not to touch it); C^2H^K (the texts on the collection box inform consumers that this is commercial wash); C^3H^K (the texts in the picture on the wall where consumers can see when they are to purchasing the coffee inform that reusable packaging is same hygienic as what consumers are used to have) 2. Visual lens: C^1H^K (putting two graphic images meaning no bacteria and no touch at the end of each sentence); C^2H^K (graphic illustration of how packaging is washed and circulated across different stakeholders was given next to commercial wash); C^3H^K (the picture of hand wash was given next to texts to inform the quality washing)	1. To persuade consumers the packaging is hygienic 2. To explain that the packaging is bacteria-free and warn other consumers not to touch it.
C^1H^F: (*The hygiene of use context*)—Bottles on the table could be a hygienic concern	Error-proofing lens: using box to contain bottles on the table	To establish a physical barrier to prevent other consumers to touch the bottles
C^1F^A: (*Consumers' perception of paying deposits*)—Feeling of deposit leads to more costs/Paying deposit is an issue/Paying deposits seems financially risky/Paying deposits seems a lack of transparency	1. Architectural lens: adding an information board in front of the table to explain the gravity of the plastic crisis 2. Visual lens: using graphic image to implicate that purchasing Case 1 equals multiple purchasing of single-use packaging	1. To increase consumers' environmental awareness and trigger purchasing intention 2. To highlight the importance of adopting Case 1 which could encourage consumers to overcome obstacles
C^2F^A: (*Consumers regarding payment plan as financial discomfort*)—Subscription seems financial risky/Dislike to pay for subscription/Financial stress in using the service	1. Eco-choice: enabling consumers another payment option which is pay-as-you-go. 2. Cognitive lens: adding textual and graphic information on the payment pages of mobile app to highlight the security and flexibility of the payment. 3. Persuasive lens: adding an extra reminder through app when there is within 24 h to return the packaging.	1. To offer an option that consumers can accept easily 2. To make it very clear that the payment system is reliable and no pressure to stay in the service 3. To ensure consumers return the packaging on time for avoiding extra charge
C^3F^K: (*Consumers regarding payment plan as financial discomfort*)—Sharing financial details seems risky	Cognitive lens: adding textual guarantee on the mobile app page when consumers are about to register bank account details	To influence consumers' decision-making process and make it very clear that companies will not charge consumers for no reason.
C^1F^P: (*Consumers' perception of paying deposits*)—Relatively expensive deposit/Charging consumers' deposit is hard	Informational strategy: using interrogative and personified sentences to underline that the deposit is fully refundable	To assure consumers that they are not paying more because the deposits are refundable.
C^3F^P: (*Consumers regarding payment plan as financial discomfort*)—Unreturned packaging is financially risky	1. Structural strategy: increasing the availabilities of the drop-off locations 2. Eco-spur: establishing the reward mechanism for consumers to buy four drinks getting one for free on the main app page. 3. Eco-technical: enabling collection machine to have the function to issue receipt when consumers returned the packaging	1. To make it more convenient by facilitating consumers to return the packaging. 2. To incentivize consumers to return the packaging and repeat the purchase. Therefore, they have to return packaging on time. 3. To reduce consumers' concern regarding inaccurate defection of returning packaging
C^2M^V: (*Consumers' motivation in adopting the services/Consumers lack the motivation in paying for environmental protection*)	Architectural lens: merging first five mobile pages into one page and removing pages related to provide their personal information.	To make it more convenient by simplifying the service touchpoints in the user journey
C^1U^F/C^2U^F/C^3U^F: (*Consumers' access to the drop-off locations/Returning the empty packaging*)	Structural strategy: increasing the availabilities of the drop-off locations	To make it more convenient for facilitating consumers to return the packaging
C^1U^P: (*Consumers' understanding of the use instruction of the service*)	Eco-choice: putting a bundle of leaflets about how the system works on the table for consumers to take and read	To offer a less stressful way to understand how the system works
C^2U^P: (*Consumers' feeling of inconvenience in adopting particular service touchpoints*) *I. Consumers could feel difficulties regarding entering code to verify the consumers identifies.* *II. Consumers may not like to cancel subscription service via email.* *III. Consumers could feel sign-up process too complicated*	1. Eco-steer (addressing I): replacing entering code for verifying consumers identifies by scanning QR code for verification 2. Eco-steer (addressing II): adding a function on mobile page for consumers to cancel their subscription 3. Architectural lens (addressing III): removing the unnecessary service touchpoints	1. To encourage consumers to adopt the service by facilitating the verification process 2. To reduce consumers' financial stress by enabling them to cancel the subscription directly. 3. To make it more convenient by simplifying the service touchpoints in the user journey

Table 8. The behaviour change strategies used to address the user acceptance issues after the second evaluation.

Issues: Themes Are in the Backets and Codes Come after the Hyphen	Behaviour Change Strategy: Details of the Behaviour Change Strategies in the Brackets	Aim
C^1H^K: *(Consumers' biased of the hygiene of reusable packaging/Lack of the understanding of the washing process/The effectiveness of persuasion from business)*	1. Architectural lens: requiring staff to sanitize the bottles in front of consumers. 2. Persuasive lens: implementing a digital screen to show the live demonstration of the washing process 3. Visual lens: playing some auditory sounds along with the video to inform consumers that the washing process has credential certificate (e.g., bacteria-free proved by NHS)	1. To show consumers that the hygienic issues are fully considered. 2. To show the fact for those who concern what is the washing process. 3. To persuade consumers that the washing process is high standard.
C^2H^K: *(The effectiveness of persuasion from business)*	Persuasive lens: implementing a digital screen to show consumers the live demonstration of the washing process	To show the fact for those who concern what is the washing process.
C^1H^F: *(The hygiene of use context)—Cannot control others' behaviour/Concern packaging touched by other people*	Error-proofing lens: removing bottles on the table to a cupboard that only staff can access.	To prevent the potential cross-contamination by disenabling other consumers to touch the bottles.
C^2H^F: *(The hygiene of use context)—Seeing a disgusting scene is negative/Cleaning service gap/Cannot control others' behaviour*	1. Error-proofing lens: redesigning the collection box to require consumers to insert empty packaging to a hole so that they will not see the inside of the box 2. Architectural lens: adding an extra food waste bin in which consumers can dispose their unfinished food.	1. To prevent consumers from seeing the inside of the box therefore consumers won't be triggered to concern the hygienic issues. 2. To facilitate consumers to bin the unfinished food in order to avoid food waste in the collection box.
C^2F^A: *(Consumers' perception of pre-paid services)—Competitors give a free try first/Desire to better understand the quality of the service/Unsure whether like the service or not before paying for it*	Eco-choice: giving consumers the option of free trial in the page of selecting	To offer an option consumers can experience the service first therefore they can accept it easily.
C^1M^V/C^2M^V: *(Consumers' motivation in adopting the services)*	Eco-spur: C^1M^V (creating an incentive that is to give a voucher for consumers who use this service 4 times); C^2M^V (creating an incentive to give a free takeaway for those who use this service four times and also give them a sense of achievement by giving them titles of the reuse.)	To reward consumers' adoption by offering the benefits that are directly relevant to them. Therefore, it can motivate consumers to adopt the service
C^1U^P: *(Consumers' understanding of the service)*	Architectural lens: employing staff near the equipment who can explain how the service works and answering questions.	To offer a service that is more responsive and interactive that consumers can accept more easily.

5. Discussion of the Results

The application of the behaviour change strategies to address the user acceptance issues resulted in the development of a set of design recommendations, aiming to support packaging professionals in designing the user experience of RPSs. However, these insights may only be applicable for the cases with similar characteristics to the ones that were analysed in this research. Table 9 shows the key characteristics of these three RPSs cases.

Table 9. The key characteristics of Cases 1, 2 and 3.

	Key Characteristics
Case 1	Consumers visit the providers/pay per refill service/consumers pay deposits/consumers return the empty packaging
Case 2	Consumers visit the providers/pay for subscription for packaging service/consumers may be charged for deposits/consumers return the empty packaging
Case 3	Consumers visit the providers/pay per refill service/consumers may be charged for deposits/consumers return the empty packaging

5.1. Refined User Experience

This research provided, for each case under analysis, refined user experiences that might increase the user adoption rate. These refined user experiences might support packaging professionals in the design of RPS that share similar key features with the case under analysis. For instance, if the packaging professionals design a user experience that is similar to Case 1, the refined user experience might be used as a source of inspiration. The refined user experiences can be found in Appendix A.

5.2. Design Recommendations to Address These Issues

Design recommendations were developed based on the insights arising from the evaluation and refinement of these three cases. As this research was carried out iteratively, insights (i.e., positive and negative comments from the participants) were received in the different phases of the evaluations, contributing to the development of design recommendations. For instance, in terms of refining the payment methods of Case 2, positive comments on pay-as-you-go and negative comments on pay for subscription suggest that, in order to implement RPSs, businesses may consider pay-as-you-go as the primary payment method, as consumers may not want to be locked into an unfamiliar service. As a result, these insights were analysed and developed into design recommendations. The following sections describe these design recommendations.

5.2.1. Design Recommendations to Address Hygiene Issues

Packaging Professionals Should Consider Giving Live Demonstrations of the Packaging Washing Process

Firstly, hygiene is critically important, and packaging professionals should eliminate consumers' hygienic concerns. This research identified that reusable packaging that circulates across different consumers can trigger consumers' concerns about hygiene, which was especially highlighted during the COVID-19 period. The key issue is how to effectively persuade consumers that the reusable packaging is also hygienic. Paradoxically, persuasion can be easily perceived by consumers as a marketing strategy, rather than informing them. This point was endorsed in the second evaluation of Case 1. The original strategy aimed at convincing consumers that the hygienic issues were considered and eliminated through textual and graphic information; however, the participants perceived the information as a marketing strategy, and directly rejected it. This phase of research provided the insights that showing the live demonstration of the packaging washing process can reduce participants' hygienic concerns, as it can give consumers a feeling that the businesses are honest and show the actual washing process. In order to make the persuasion more effective, packaging professionals could also consider using the information from a credential source to reduce consumers' hygienic concerns. Both points can be endorsed in the third evaluation of Case 1: the live demonstration of packaging washing process was integrated into Case 1, with the aim to show that the businesses have nothing to hide, and only provide facts to persuade consumers. Moreover, the auditory information about how the washing process was credentialed was given along with the live demonstration of the packaging washing process, leading to the better elimination of hygienic concerns.

Packaging Professionals Should Design the Service in Order to Not Allow People to Access the Packaging if They Don't Want to Use the Service (Particularly in the Self-Service)

One of the key hygienic issues identified in this research was that consumers might speculate that other people touched the packaging that they use, which may lead to hygienic concerns. For instance, in the first evaluation of Case 1, participants speculated that the bottles openly placed on the table were likely to be frequently touched by other consumers, thereby causing hygienic concerns. The solution should aim to not allow people to access the packaging if they don't want to use the service. This research provided one solution based on the third evaluation of Case 1: the bottles were kept away from people and managed by employees. Consumers may need to ask employees to use the service, and employees would refill the packaging for consumers. Therefore, this should give consumers a feeling that the bottles would be properly managed, and other consumers could not touch the bottles. Hence, this can lead to the reduction of hygienic concerns.

Packaging Professionals Need to Consider How to Maintain the Hygienic Standard of the Designated Locations for Consumers to Return the Packaging

Consumers returning the empty packaging should be a key service touchpoint. However, this can easily trigger consumers' concerns about hygienic issues. For instance, in the first and second evaluations of Case 2, when consumers opened the collection box to return the packaging, they could see the unfinished food and packaging piled in the box, and this image triggered consumers' concerns about the washing process of the packaging and the hygienic standards. One strategy was generated based on the third evaluation of Case 2: a box for consumers to throw the unfinished food into was integrated into the service touchpoint, allowing consumers to throw the unfinished food in the box, contributing to the maintenance of the hygiene standards.

5.2.2. Design Recommendations to Address Usability Issues

Packaging Professionals Should Consider How to Maximize the Availability of the Service Providers

Because RPSs could already be burdensome for consumers to adopt, packaging professionals should consider minimising consumers' efforts spent on the adoption of the service. The results of this research show that returning the empty packaging is one key challenge that directly influences the convenience of those RPSs. Accordingly, the key consideration should be placed on how to increase the availability of the service providers (e.g., drop-off locations). This strategy is effective, and is endorsed by multiple scholars [17,58–63]. This point can be also reflected in the second evaluation of these three cases, as a significantly decreased number of participants argued about the usability after this issue had been addressed. Moreover, the locations to deploy the collection box can be inside the location of the service providers, in order to link the sales with the return of the packaging [62,63]. This is financially beneficial for the business.

Packaging Professionals Should Design the Service to Allow Consumers to Obtain the Instruction Information in a Convenient and Responsive Manner

Some inconveniences prior to the purchase can be highlighted as well. As the RPSs might be novel services that consumers are unfamiliar with, consumers should learn how the new services work. If consumers need to self-learn how to use the services, businesses need to make the textual information concise enough for consumers to absorb quickly. However, some consumers may not be confident in understanding the information in the self-learning format. Therefore, packaging professionals also need to design the service to be responsive to consumers' questions. For instance, if consumers are not sure about how to use the service, there should be an easy channel for them to ask questions and receive the answers quickly. In the third evaluation of Case 1, the service was further designed by deploying employees to answer questions. Consequently, consumers can take the leaflets to read, understand how the service works, and also ask employees if they have any questions. Latterly, no participant argued this issue.

Packaging Professionals Should Avoid Collecting Consumers' Personal Data, or Should Collect Only the Personal Data That Are Strictly Necessary

Consumers may consider it inconvenient when the service is designed to collect their personal data (e.g., occupation, email address, or home address). Therefore, packaging professionals should exclude these activities when designing the service. In the first evaluation of Case 2, consumers argued that it was unnecessary and burdensome to offer their personal data to the business. As a result, it is better not to collect customer data if this does not negatively impact service functionality.

Packaging Professionals Should Design the Service to Enable Consumers to Opt out Easily

In order to retain consumers, some businesses make the sign-up process easy but the cancellation process relatively complicated. In terms of the adoption of RPSs, consumers may view a complicated opt-out process as burdensome; this may also cause them to have negative associations with the offers. For instance, in the first evaluation of Case 2, participants had negative perceptions about email cancellation, because they saw this cancellation method as inconvenient. Consequently, packaging professionals should facilitate the opt-out process. In the second evaluation of Case 2, a cancellation function was included in the mobile app in order to facilitate this process, and there was no participant arguing this aspect afterward.

5.2.3. Design Recommendations to Address Motivation Issues
Packaging Professionals Should Provide Financial Benefits in Order to Attract Consumers to Adopt the Services

Although motivation can be influenced by different factors (e.g., benefits, personal pleasure, or a sense of achievement), this research suggests that financial benefits play a significant role and are directly relevant to consumers. For instance, in the second evaluation of Case 1 and Case 2, some participants were arguing what the benefits would be in them adopting the offers. However, when financial benefits (e.g., discounts, vouchers, free trials or promotions) were offered, the participants were motivated to adopt the offers, demonstrating the importance of having the financial benefits.

Packaging Professionals Should Highlight the Environmental Benefits of Consumers' Adoption, and Should Make Consumers Realise That Their Efforts Can Make a Difference

It may be possible to improve the RPS adoption by highlighting the environmental benefits (e.g., reducing plastic waste to protect the environment). This factor was included in the second evaluations of Case 1, Case 2 and Case 3. The participants were informed that the adoption of these three services can reduce plastic waste, leading to environmental protection. It would also be important for consumers to feel that their efforts can make a difference. For instance, the third evaluation of Case 2 included a scoreboard in the mobile app that highlighted customers' efforts to reuse packaging. This type of feature can help customers feel that their efforts would be appreciated. Accordingly, packaging professionals should highlight the environmental benefits and incorporate recognition of customers' efforts in protecting the environment (e.g., reusing packaging) in the design of these RPSs.

5.2.4. Design Recommendations to Address Finance Issues
Packaging Professionals Should Consider Pay-as-You-Go as the Primary Approach to Charging Consumers

Currently, two main approaches are used to charge customers: subscription and pay-as-you-go. This research shows that consumers may prefer pay-as-you-go. In the first and second evaluations of Case 2, the participants argued that they did not want to commit to a service that they were not familiar with. This feeling of unfamiliarity could make consumers view a subscription plan as a commercial strategy to induce them to pay more. Pay-as-you-go is more flexible, and consumers could easily accept this approach. For instance, in the first evaluation of Case 1 and Case 3, the participants had no issues with

the pay-as-you-go approach, suggesting that this payment option could be better than the subscription for RPSs.

Packaging Professionals Should Clearly Communicate That the Deposits Are Refundable through Explicit Textual Information

Consumers might have concerns about losing their deposits even if they are informed that the deposit is refundable. In the first evaluation of Case 1, the participants worried that the business might find some excuse (such as damage to the packaging) to refuse to return the deposit. Therefore, it is important to highlight that the deposit is fully refundable. Packaging professionals can use text and/or images to convey this information. In the second evaluation of Case 1, personified texts and rhetorical questions were used to clearly state that the deposits were fully refundable, and no participant argued this issue subsequently.

Packaging Professionals Should Prefer the Deposit Refund System over the Penalty Charge System in Order to Encourage Consumers to Return the Packaging

There are two ways for businesses to encourage customers to return the packaging. First, businesses can charge customers a deposit for the packaging, and this deposit is refunded when the packaging is returned. Alternatively, businesses can use a penalty system in which customers must supply their financial data (e.g., bank account) and businesses then charge consumers for packaging that is returned late or not at all. This research founds that the penalty system might cause issues that affect the adoption of RPSs. In the first evaluations of Case 2 and Case 3, both imposed a charge for packaging that was not returned or returned late. However, some participants said that they wouldn't use the service due to the possibility of a penalty, and preferred single-use packaging products as a result. The deposit return system may be an easier and less stressful approach. Although this approach may also have some negative aspects, such as inconvenience (e.g., collecting and returning deposits may involve more work), customers are more open to this approach. In the second evaluation of Case 1, after participants were better informed that the deposits were fully refundable, no participants raised issues about the deposits. However, some participants were concerned about the financial charge if they unpunctually returned the packaging, which should refer to the penalty charge system. Therefore, packaging professionals should consider implementing the deposit-refund system.

6. Limitations of This Research

Three limitations were identified. First, the differences between in-person evaluations and virtual evaluations must be acknowledged. In-person evaluations could provide the opportunity to gather more details of the user experiences, and could thus generate more insightful data. For this reason, future research could focus on in-person evaluations (e.g., by using physical packaging and a simulation of the environments where the user experience is supposed to take place). Moreover, although this research provides refined user experiences that consumers may accept theoretically, it remains uncertain that consumers can accept them and continue to use these RPSs in practice. Therefore, in-person evaluations could also provide insights into this aspect.

Second, this research has focused on improving user acceptance on the basis of consumers' insights. However, the feasibility of implementing any improvements also needs to be validated from the business perspective. For instance, while financial incentives can induce the adoption of RPSs, business insights are important in order to determine which format of financial incentive (e.g., vouchers, product promotions, or price discounts) is most effective, taking into account profit margin loss considerations. As a result, some of the design recommendations may not be viable for businesses to implement.

Finally, although this research identifies the user acceptance issues and develops a set of design recommendations, these insights may be only generalized to certain cases within these three archetypal models. Although some of the user acceptance issues and design recommendations may also be applicable to cases in other archetypal models, this research cannot claim this insight without empirical evidence.

7. Conclusions

The implementation of RPSs is one of the promising solutions to tackle the packaging waste problem, and to achieve a circular plastic economy. Although these solutions are in an early stage of development, the recognition of their positive impact on the environment can lead to the creation of more novel solutions. However, consumer adoption is a key issue that should be focused on for wider implementation. Currently, the literature on this subject is scarce and does not offer an understanding of the issues or how to address these issues. In this study, we explored consumers' adoption of RPSs by identifying the user acceptance issues, and we presented design recommendations to address them.

This research made two contributions. (1) It appears to be the first study that provides specific user acceptance issues affecting the adoption of RPSs. This research shows that consumers have concerns with issues relating to hygiene, usability, motivation and finance, highlighting the factors which packaging professionals should consider when designing the user experience of RPSs. It is interesting to note that hygienic issues were not anticipated, and could play an important role in influencing consumers' adoption. As the reusable packaging may be shared across different consumers, the circulation of the packaging may significantly affect consumers' acceptance of RPSs. This insight was not extensively highlighted in the current literature. (2) It offers a set of design recommendations based on the refinement of these three user experiences to support packaging professionals to address these four user acceptance issues. Packaging professionals include packaging entrepreneurs (professionals who establish the packaging business to offer reusable packaging solutions), packaging consultants, and professionals who deal with packaging aspects as employees in retail, food and beverage, personal care products, or house cleaning products industries. For instance, packaging entrepreneurs could apply these design recommendations to refine their RPSs; packaging consultants can learn from the user acceptance issues and design recommendations to offer advice to their clients about the user acceptance issues to be considered and how to address them. In conclusion, the research outcomes contribute to supporting packaging professionals in the successful implementation of RPSs.

Furthermore, this research provides an alternative approach to exploring the subject of behaviour change. Whereas behaviour change research often adopts quantitative research methods (e.g., surveys) to examine relationships among different behaviour factors [18,64–68], this research sets one of the examples of how to qualitatively investigate the behaviour change subject. The semi-structured interview was applied to identify the issues affecting user acceptance. The Theory of Attitude-Behaviour-Context was adapted and applied in order to analyse the defined user acceptance issues, and the behaviour change strategies from Design for Sustainable Behaviour were used to address these issues, improving consumers' adoption.

Opportunities for future research should be highlighted as well. First, because we could not focus on all of the archetypal models due to the time constraint, this research only investigated three cases within three archetypal models individually. Therefore, further study could focus on other archetypal models to investigate other cases, in order to identify a wide range of user acceptance issues. Second, although this research refined three user experiences that consumers can accept theoretically, these insights should be developed in practice, evaluating whether consumers can accept them in the practice. One of the possible solutions is to implement service staging or solution enactment (service staging [69] and solution enactment [70] both refer to a method that evaluates the product/sevice by simulating the product/service's user experience, in which participants can immerse themselves for evaluation) to prototype these refined user experiences and recruit participants to physically use these services in order to understand their acceptance. Third, even if the design recommendations were theoretically confirmed to be useful based on consumers' perspectives, it was not possible to know the feasibility of the implementation of those strategies based on business perspectives. Further study could also invite participants from the business sectors to practically evaluate those three refined user experiences and design

recommendations in order to understand the potential business barriers associated with their adoption.

Appendix A The User Experience Evaluated in This Research

In order for them to remain anonymous, the companies' names and logos were removed from the user experience.
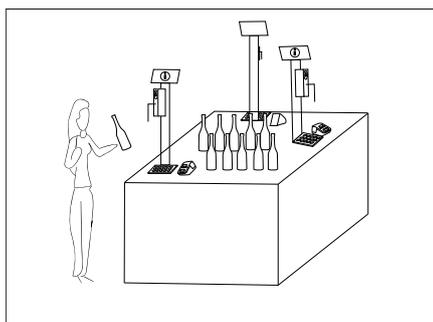

1. A consumer takes a bottle on the table.
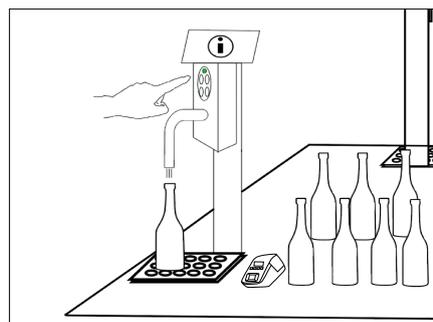
2. She learns how this service works by reading the instruction on the dispenser. After, she places the empty bottle under the dispenser and selects the option.
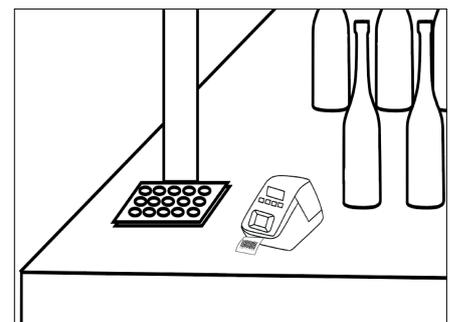
3. The price tag is generated and peeled automatedly.
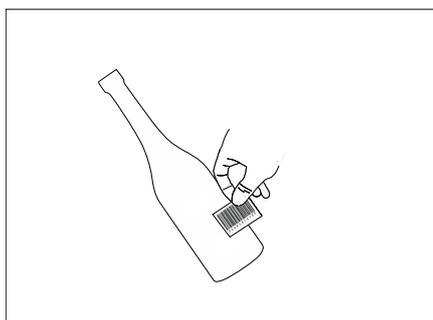
4. She sticks the price tag on the bottle. Price tag includes name of the product, price of the content , the quantity of the product and ingredients of the content. The barcode on the bottle refers to price including the deposit.
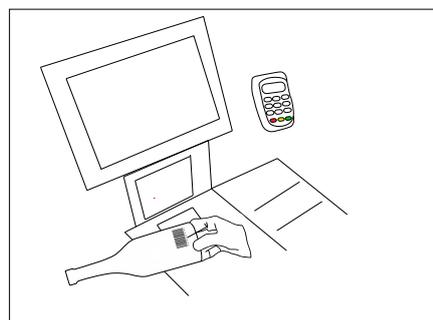
5. She goes to the counter for checkout. She pays for the product and leaves the place.
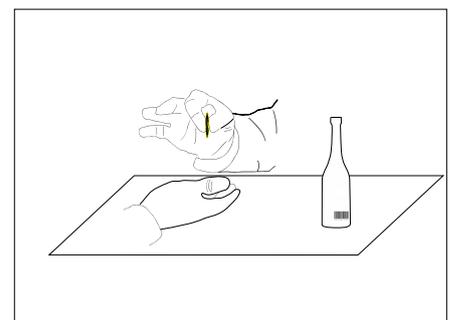
6. After finished the products, she carries the empty bottle to the stores, where they have collaboration with Case 1, for the deposit refund.

Figure A1. The first version of Case 1.
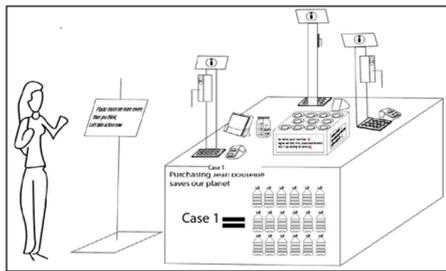
1. A consumer passes by the service equipment and attracted by the information board which is about plastic issues, raising environmental awareness.
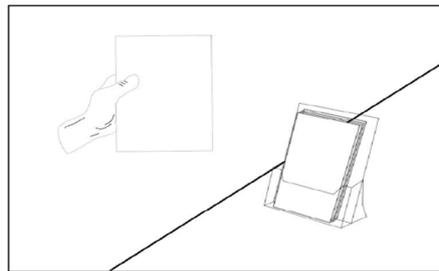
2. If feels interested in this service, she can take one of the the leaflets and take time to read and understand how to use the system.
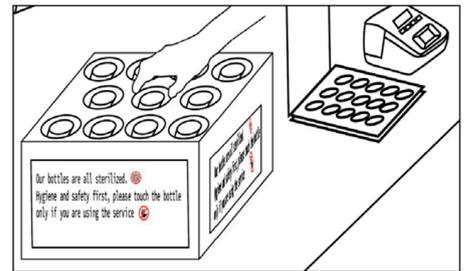
3. She takes a bottle in the box. On the surface of the box, it explains all bottles are sterilized and remind consumers not to touch the bottle if don't want to use the service.
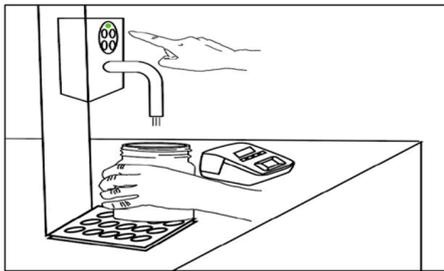
4. She selects the button for dispensing their preferable products in the preferable quantity following the instruction.
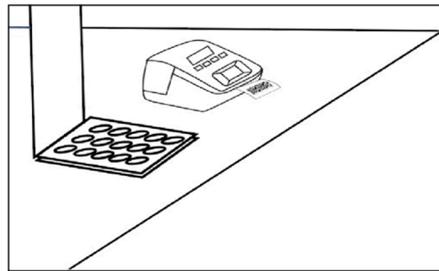
5. After the dispensing is done, the price tag is generated. Price tag is peeled by the machine automatically.
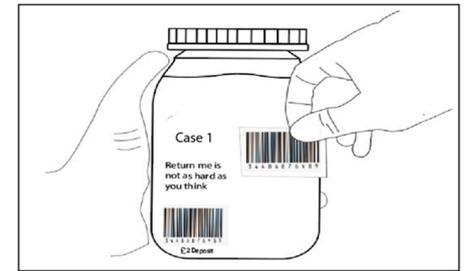
6. She takes the price tag and stick the price tag on the bottle.
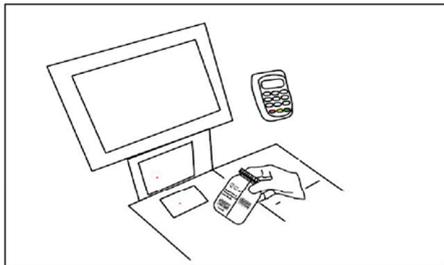
7. She goes to the checkout to pay for the product and leaves the place.
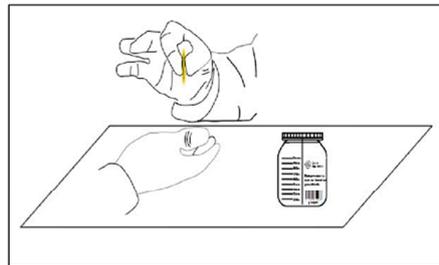
8. After finished the product, she carries the empty bottle to the stores where they have collaboration with Case 1 for the deposit refund. (There are many collaborated stores).

Figure A2. The second version of Case 1.
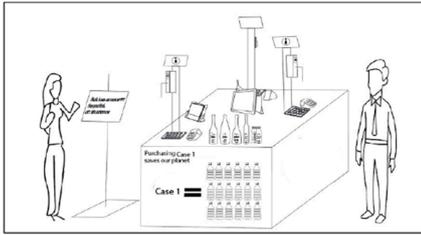
1. A consumer passes by the service equipment and attracted by the information board which is about plastic issues, raising environmental awareness.
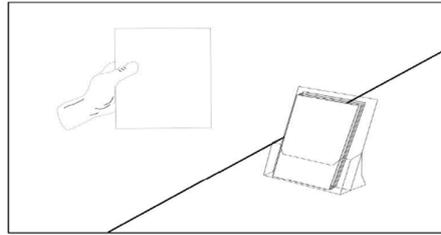
2. If feels interested in this service, she takes one of the the leaflets and take time to read and understand how the system works.
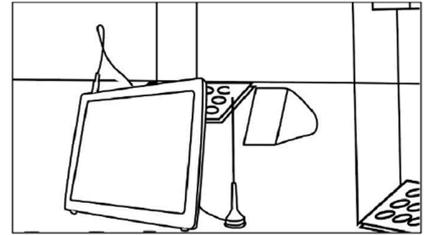
3. The digital screen shows how the packaging got washed on live. The auditory information about the washing process is played to inform consumers that the washing process is NHS approved.

4. Also the staff can explain how the service works and answer any question. If she wants to use the service, consumer can approach to the staff and tell him that she wants to use the service.
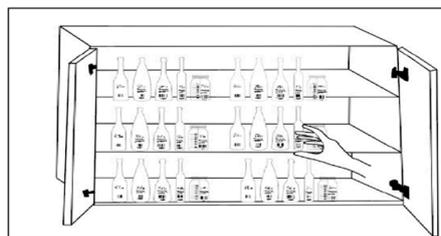
5. The staff goes and takes one bottle from the cabinet in the store.
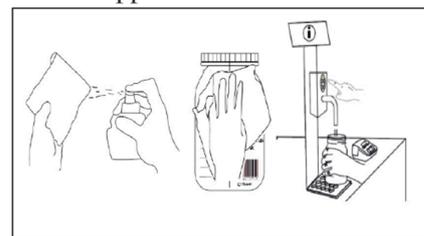
6. The staff cleans the bottle in front of her. Spraying the ethanol in tissue, wiping the bottle and refill the bottle for her.
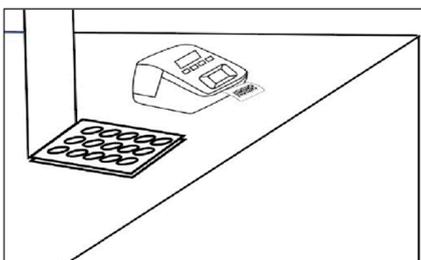
7. After the dispensing is done, the price tag is generated. Price tag is peeled by the machine automatically.
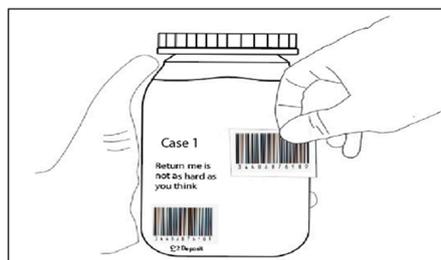
8. The staff takes the price tag and sticks the price tag on the bottle.
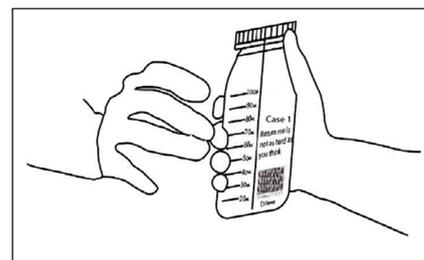
9. Then, the staff handovers the products to her.
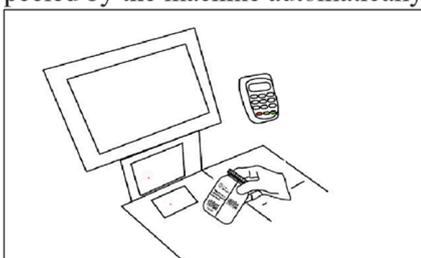
10. She goes to the checkout and scans the product to pay for the product (Overall, she pays less considering that she would not pay for the cost of the packaging) and leaves the place.
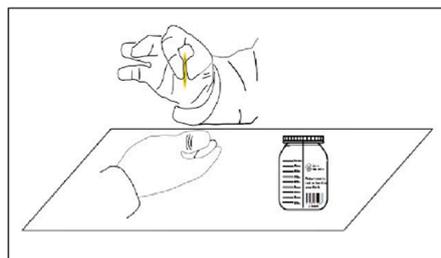
11. When finished the product, she carries the empty bottle to the stores, where they have collaboration with Case 1, for the deposit refund. (There are many collaborated stores). If she repeats purchasing the service. Every 4 reuse, company will issue a voucher.

Figure A3. The third version of Case 1.

1. If it is consumer's first time to use this service, she needs to sign up first. After opening the app, those five interfaces are to briefly explain how Case 2 system works.
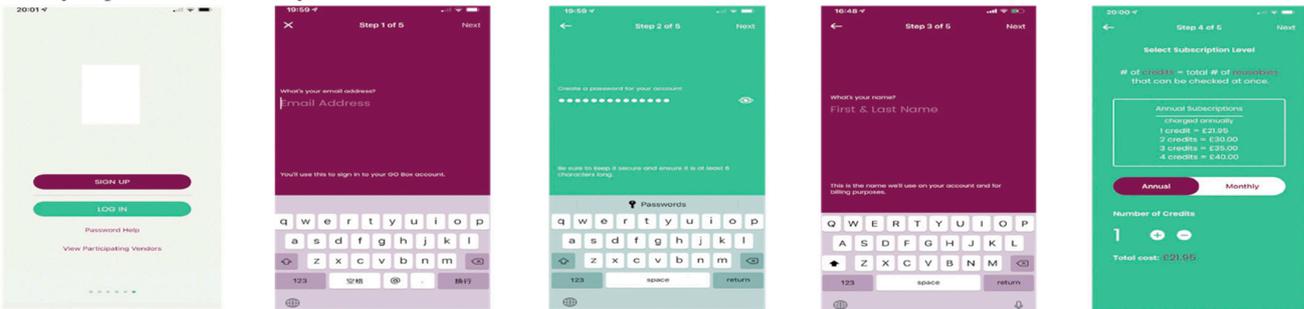
2. She needs to enter her email address, create the password, provide the first and last name and chooses her subscription plan.

3. She needs to enter the card details to purchase her selected subscription plan. The app provides the list of food providers.
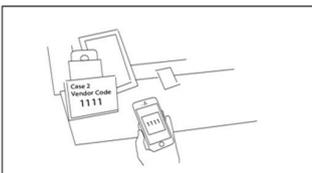
4. When arriving at her preferable food provider, she needs to find the Case 2 code. Then, she opens the app and enters the codes.

5. After the code is verified. She shows the verification to the food provider.
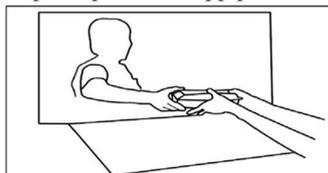
6. She orders her food, makes the payment and leaves the place.
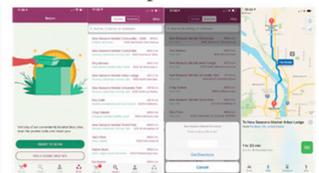
7. After finished the food, she keeps the empty packaging and use the app to find the nearest drop-off location and navigate to go there.
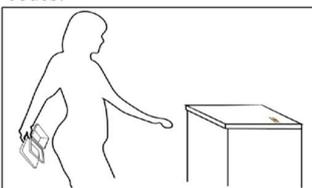
8. When arrived at the location, she goes to the box (failing to return the pakcaigng on time results in 5 US dollars charge).
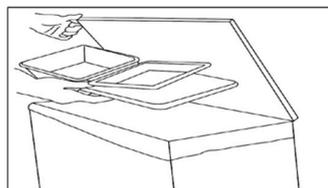
9. She opens the box, make the packaging open, put the packaging into the box and close the box.
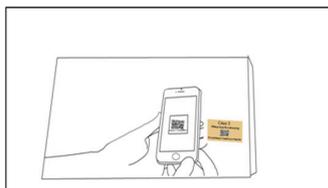
10. She opens the app and scan the QR code to inform Case 2 that the packaging is returned (If consumer decided not to use the service, consumer needs to write an email to Case 2 to cancel the service).

Figure A4. The first version of Case 2.
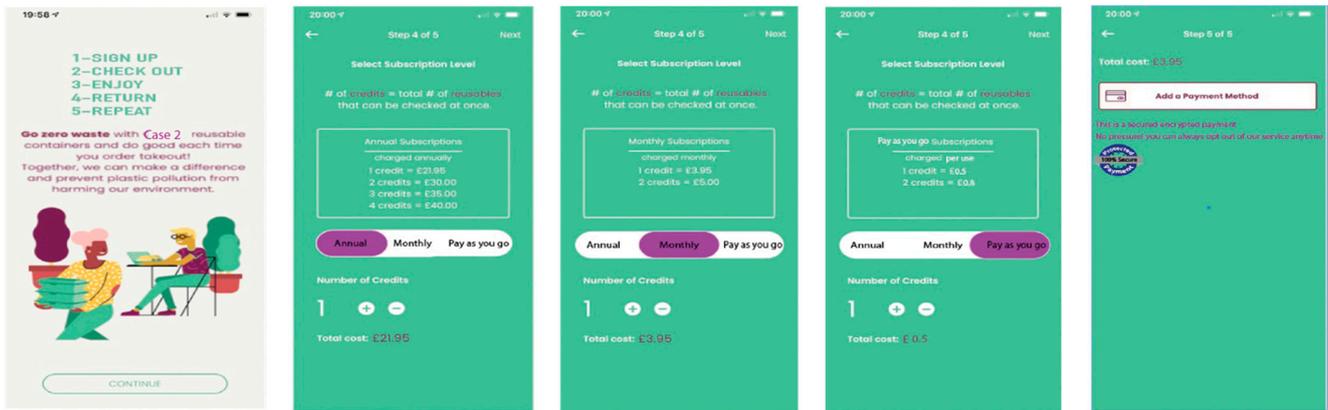
1. If it is consumer's first time to use this service. She signs up first. The app explains how system works and promote environmental awareness. She can choose her preferable subscription plan and make the purchase.
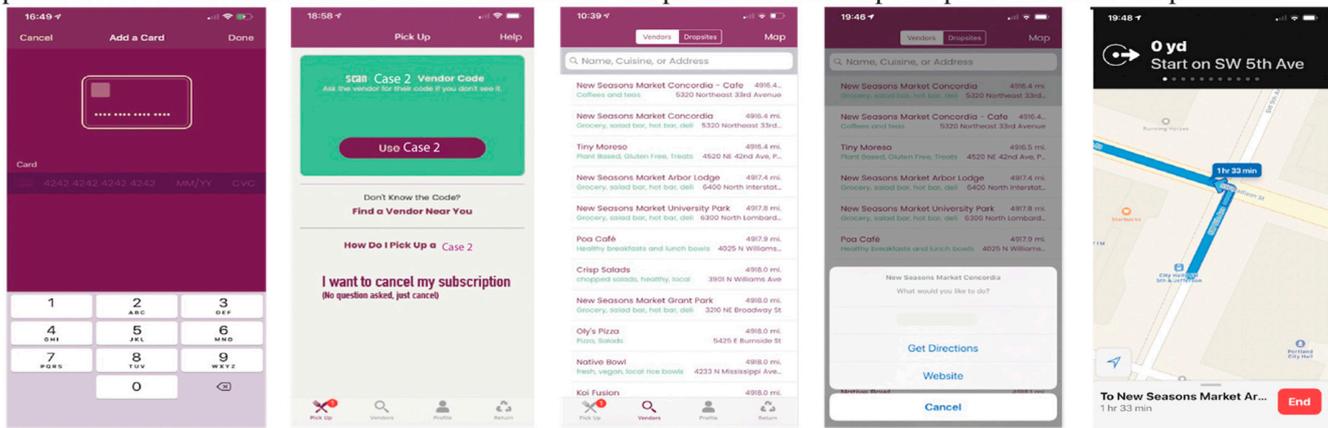
2. After purchase is done, she sees the list of the food providers and choose which one to go.
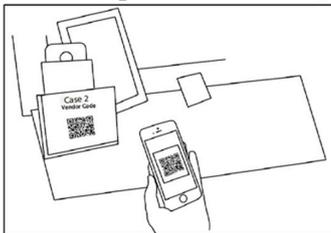

3. After arrived at her preferable food provider, she scans the QR code to verify her identity.
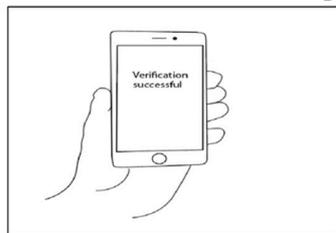
4. She shows the verified interface to the food providers.
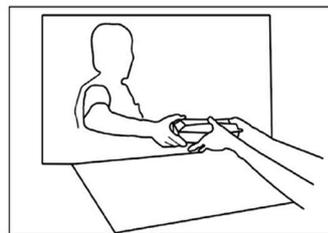
5. After she pays for the food, the food provider gives food to consumer.
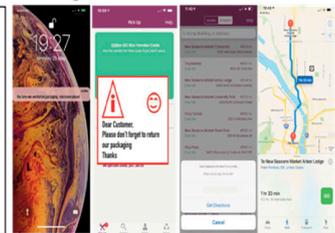
6. The app reminds her to return the empty packaging. She uses the app to find the nearest drop-off location (There are a lot of sites around consumer).
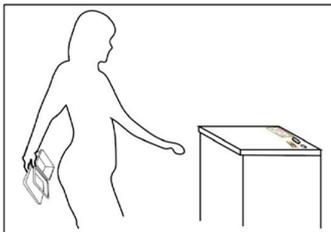
7. She arrives at the return location that is open 24/7.
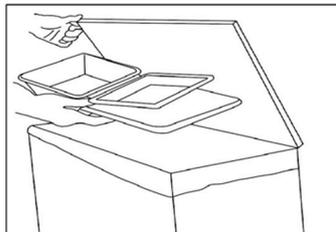
8. She opens the box to return the packaging.

9. She opens the app and scan the QR code to inform the return of packaging. There are texts to nudge consumers that the packaging is washed properly on the box.
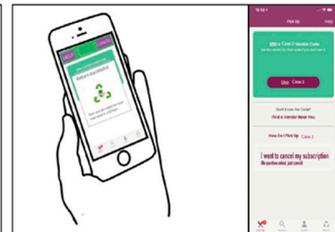
10. She receives the confirmation and an appreciation. If She wants to cancel the subscription, she can just click there.

Figure A5. The second version of Case 2.
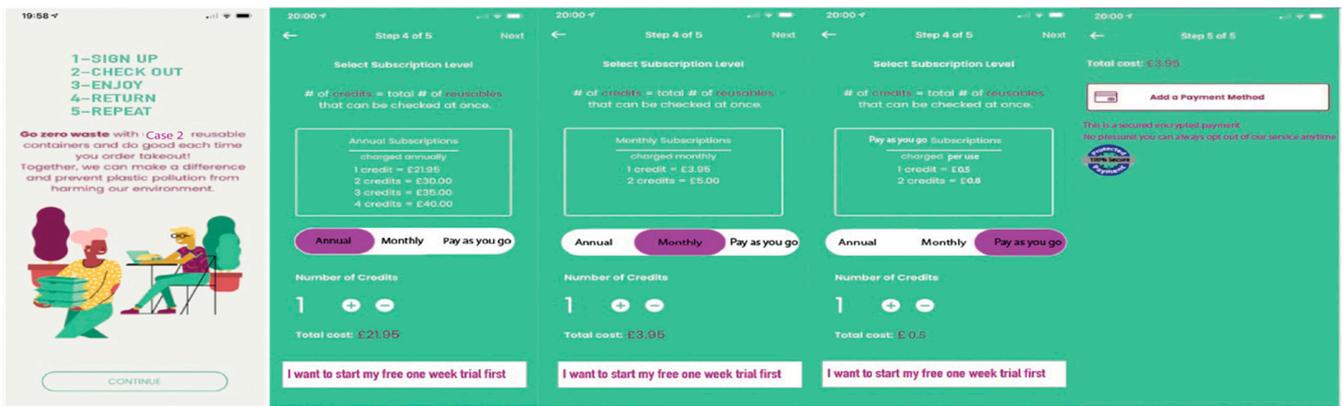
1. If it is consumer's first time to use this service, she signs up first. The app explains how system works and promote environmental awareness. She can choose the preferable payment plan and make the purchase.
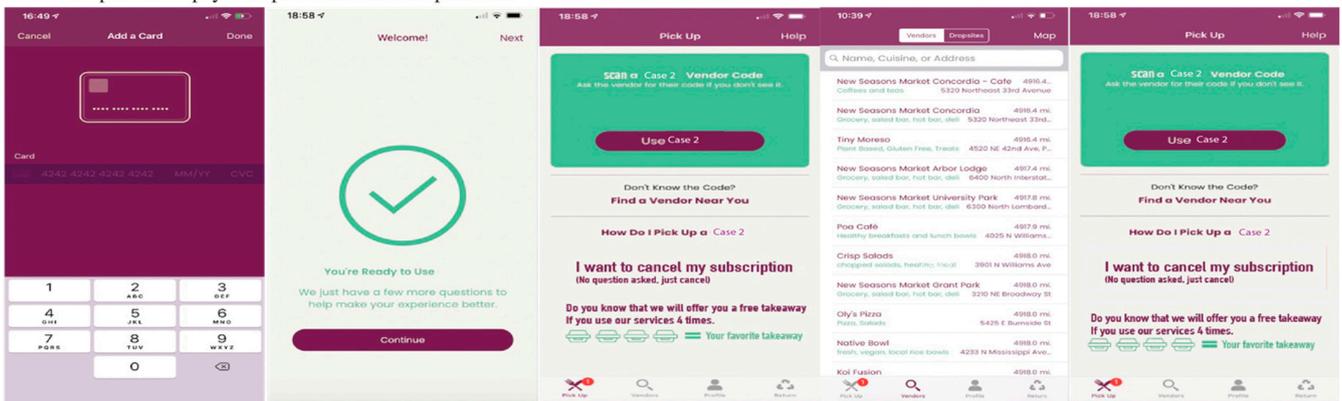
2. After, she can see the list of the food providers and choose which one to go. She can cancel the subscription plan at anytime and there is an incentive that is buy 4 get 1 for free.
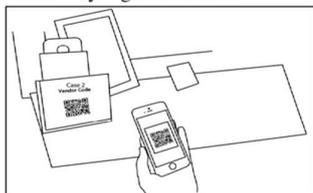
3. When arriving at her preferable food provider, she scan the QR code to verify her identity.
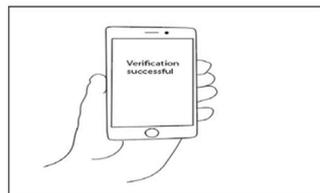
4. She shows the verified interface to the food providers.
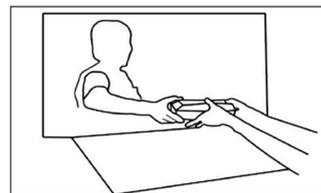
5. After she pays for the food, the food provider gives food to her.
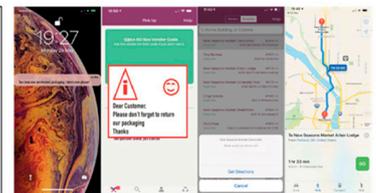
6. Case 2 app reminds her to return the empty packaging (There are a lot of return locations).

7. She arrives at the return location that opens 24/7.

8. If she has some unfinished food, she can dump the food into the bin. The bin is collected frequently.
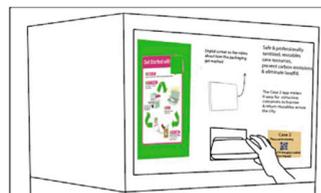
9. She puts the empty packaging into the collection box. There is a digital screen that explains how the packaging gets cleaned.

10. She opens the app and scans the QR code to inform the return of the packaging. She receives the confirmation and appreciation.

Figure A6. The third version of Case 2.

1. If this is the consumer's first time to use this service, he firstly downloads the app. This app briefly explains how their system works. Then, he would be required to add bank card details. No payment would be taken at this stage.

2. He can use the app to find the coffee stores he wants to go. The app can provide nagivation.


|		
3. When he arrives at the place, he can order his preferable coffee.	4. In order to use Case 3 service, he needs to open the app, touch "scan" and scan the QR code and make the payment.	5. When coffee is ready, he takes the coffee and leave.
6. After finished the coffee, he keeps the cup and using the app to navigate to the drop-off sites.	7. After arrived at the place, he finds the collection box and put the empty cup into the box. He puts the lid and cup separately in the box.The lid goes to the rectangle slot and mug (put upside down) goes to the round slot.	8. Finally, Case 3 automatically detects the returned cup and some data would be captured by the app and he can know how times the service is used (If he forgets to return the cup, he will be charged 3 US dollars).

Figure A7. The first version of Case 3.

1. If this is the consumer's first time to use this service, he firstly downloads the app. This app briefly explains how their system works. Then, he would be required to add bank card details. No payment would be taken at this stage.

2. He can use the app to find the coffee stores he wants to go. The app can provide nagivation.

3. When he arrives at the place, he can order his preferable coffee.

4. In order to use Case 3 service, he needs to open the app, touch "scan" and scan the QR code and make the payment.

5. When coffee is ready, he takes the coffee and leave.

6. After finished the coffee, he keeps the cup and using the app to navigate to the drop-off sites.

7. After arrived at the place, he finds the collection box and put the empty cup into the box. He puts the lid and cup separately in the box.The lid goes to the rectangle slot and mug (put upside down) goes to the round slot.

8. Afterwards, the return box issueS a receipt to confirm that the returning of the packaging. He can take it.

9. The data will be captured and every 4 reused cups will give him a free drink.

Figure A8. The second and third versions of Case 3.

Appendix B The Codes and Themes Identified in the Thematic Analysis

Table A1. Codes and themes in the first evaluation.

Codes	Themes (The Issues Are Related to …)		User Acceptance Issues
1. Question the hygienic standard	1.	Consumers' perception of the hygiene	
2. Hygiene is strictly relevant to health			
3. Uncleaned packaging threatens health			
4. Concern other people's use of the packaging is unhygienic	2.	Consumers' biased of the hygiene of reusable packaging	Hygiene
5. Dust flies into bottles and other people touch the bottles	3.	The hygiene of use context	
6. Desire to know the washing process	4.	Lack of the understanding of the washing process	
7. Concern whether washing is done properly			
8. Concern packaging touched by other people			
9. Too many service touchpoints	5.	Complication of the service	
10. Consumers value their efforts			
11. Using this service consumes people's energy			
12. Keeping packaging is difficult	6.	Carrying packaging after finishing the products	
13. Carry bottle is inconvenient			
14. Carry bottles requires efforts			
15. Heavy bottles			
16. Girl's objection towards returning	7.	Returning the empty packaging	
17. Returning packaging is hard to perform			
18. Returning is time-consuming			
19. Why return the packaging			
20. The availability of drop-off location matters	8.	Consumers' access to the drop-off locations	Usability
21. The distance between consumers and drop-off locations is important			
22. Travel to locations is inconvenient			
23. Consumers like to stick to what they know	9.	The unfamiliar service	
24. Challenging habit			
25. Issues in buying new products before finish			
26. Prefer competitors' service			
27. Email cancellation burdensome	10.	Consumers' feeling of inconvenience in adopting particular service touchpoints	
28. Hard to verify customer's identify			
29. Sign-up process is complicated			
30. Sharing privacy should not be needed			
31. Embarrassment in standing to know the instruction	11.	Consumers' understanding of the use instruction of the service	
32. Standing also affects other consumers			
33. System hard to understand			

Table A1. *Cont.*

Codes	Themes (The Issues Are Related to …)		User Acceptance Issues
34. Sharing financial details seems risky	12.	Consumers regarding payment plan as financial discomfort	
35. Subscription seems financial risky			
36. Dislike to pay for subscription			
37. Unreturned packaging is financially risky			
38. Financial stress in using the service			
39. Charging consumers' deposit is hard	13.	Consumers' perception of paying deposits	Finance
40. Feeling of deposit leads to more costs			
41. Paying deposit is an issue			
42. Paying deposits seems financially risky			
43. Paying deposits seems a lack of transparency			
44. Wonder reason for deposits			
45. Relatively expensive deposit			
46. Unsure whether like the service or not before paying for it	14.	Consumers' perception of pre-paid offer	
47. Service lacks benefits	15.	Consumers' motivation in adopting the services	
48. Lack of the acknowledge of the importance of the service			Motivation
49. Pay for environmental protection doesn't make sense	16.	Consumers lack the motivation in paying for environmental protection	

Table A2. Codes and themes in the second evaluation.

Codes	Themes (The Issues Are Related to …)		Issues
1. Cannot control others' behaviour	1.	The hygiene of use context	
2. Seeing a disgusting scene is negative			
3. Concern packaging touched by other people			
4. Cleaning service gap			
5. Textual persuasion no binding			Hygiene
6. Concern other people's use of the packaging is unhygienic	2.	Consumers' biased of the hygiene of reusable packaging	
7. Concern whether washing is done properly	3.	Lack of the understanding of the washing process	
8. Desire to know the washing process			
9. Marketing strategies	4.	The effectiveness of persuasion from business	
10. No trust on business			

Table A2. *Cont.*

Codes		Themes (The Issues Are Related to . . .)		Issues
11.	Consumers value their efforts			
12.	Consumers prefer convenient services			
13.	Inconvenient preparation for using this service	5.	Complication of the service	
14.	The complication of the service			Usability
15.	Returning the packaging is simply difficult	6.	Returning the empty packaging	
16.	Self-understanding the service is difficult	7.	Consumers' understanding of the service	
17.	Competitors give a free try first			
18.	Desire to better understand the quality of the service	8.	Consumers' perception of pre-paid services	
19.	Unsure whether like the service or not before paying for it			Finance
20.	Financial stress in using the service	9.	Consumers regarding payment methods as financial discomfort	
21.	Crave for the benefits			
22.	Lack of the acknowledge of the importance of the service	10.	Consumers' motivation in adopting the services	Motivation

Table A3. Codes and themes in the third evaluation.

Codes		Themes (The Issues Are Related to . . . . . .)		Issues
1.	Naturally object to reusable products	1.	Concerning the hygiene	
2.	Sceptic about the hygiene			Hygiene
3.	Return the packaging	2.	Returning the packaging is inconvenient	
4.	The overall complication of the service	3.	Complication of the service	Usability
5.	Financial benefits are not enough	4.	Financial benefits are not enough	
6.	Sharing financial details seems risky	5.	Consumers regarding payment methods as financial discomfort	Finance

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