



Exploring barriers and facilitators to increase the engagement with a digital app (OLIO) for food/non-food sustainable consumption in citizens from Bogotá, Colombia

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Abstract

Engaging in sustainable behaviours is a key priority for environmental sustainability. Behavioural changes such as recycling, and food sharing are needed to achieve a zero-emissions society. Digital technologies can support engagement with these behaviours through publicly accessible digital platforms such as mobile apps which connect those with surplus items to those who need or wish to consume these items. However, very little research has examined the factors influencing engagement with mobile apps, particularly in the context of developing countries. This exploratory sequential mixed methods study used behavioural science models to identify factors influencing engagement with the Olio app, a mobile application for food and non-food items sharing in Bogota, Colombia. Influencing factors were analyzed and categorized as barriers or enablers using the Capability (C), Opportunity (O), and Motivation (M) model of behaviour (B) change (COM-B). Regarding barriers, two were strong influencers “perceived difficulty to use a mobile app” for donating items (physical opportunity, $\beta = -.25$, $p < .001$), and “lack of time to collect a used item in others’ location” (physical opportunity, $\beta = -.18$, $p < .01$). As to the enablers, the strongest predictor for collecting was “finding mobile apps to share used items to be widely disseminated on social media channels” (physical opportunity, $\beta = .27$, $p < .001$) and for donating “Knowing how to use mobile apps” (psychological capability, $\beta = .19$, $p < .01$). Findings are discussed along with implementation strategies that could potentially increase engagement with the Olio app to support sustainable consumption.

Keywords Sustainability · Digital engagement · COM-B model · Behaviour Change · OLIO

Introduction

Massive Solid Waste (MSW) is defined as materials that are discarded from residential and commercial sources including, but not limited to, tires, furniture, batteries, paper, plastics, clothes, and food (Center for Sustainable Systems, 2020). According to the World Bank each year over 2.01 billion tons of MSW are generated in the world, specifically, each person per day produces on average between 0.11 to 4.54 kg of MSW (Kaza et al., 2018). In 2016 MSW

produced about 1.6 billion tons of carbon dioxide (CO₂) (Kaza et al., 2018) due to several reasons, such as the poor methods for solid waste collection, transportation, and disposal, the natural resources used to produce those goods, and the greenhouse gas emissions from organic waste materials (Kaza et al., 2018; Vergara & Tchobanoglous, 2012).

In the case of Colombia, nearly 11.6 million tons of MSW are produced annually, of which 40% could be further re-utilized if materials are separated at source, moreover, a smaller part of this (17%) is recycled in the whole country (Monterrosa, 2019). Of the total amount of MSW produced in Colombia about 20% is generated in the city of Bogotá alone and generally ends up in landfill sites (Cortes & Gámez, 2019), which environmentalists see as a source of pollution. This is because the decomposition of waste in landfills generates leachate waters that penetrate and contaminate the soil and water resources, affecting the food chain and the ecosystem.

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The huge quantity of materials for disposal in Bogota is caused mainly by the absence of effective waste management (Monterrosa, 2019), increased consumption of single-use plastics (Castiblanco, 2021), and the lack of recycling (Malaver, 2019). Furthermore, according to the Department of National Planning of Colombia [DNP], the useful life of Bogota's sanitary landfills will end in seven years causing an enormous environmental impact and health risks to its citizens, unless the city administration seeks long-term solutions to the reduction and final disposal of solid waste (DNP, 2016). Consequently, encouraging city dwellers to reduce their wastage, thereby alleviating the environmental and health impacts, remains a critical challenge.

Engagement with digital platforms

Despite the increasing popularity of sharing economy digital platforms, there remains a paucity of evidence on digital interventions to encourage item-sharing behaviours concretely. The existing body of research is focused mainly on digital interventions to prevent food waste by targeting specific behaviours, such as decreasing unnecessary food purchases (Farr-Wharton et al., 2014) or donating and withdrawing food from a public cooling station (Pohl et al., 2017), with little or no robust evidence supporting behaviour change outcomes (Hedin et al., 2019; Reynolds et al., 2019).

However, sharing access to goods through digital platforms promises to be an effective alternative to improving sustainable consumption and reducing solid waste (Schor & Fitzmaurice, 2015). Some mobile applications suggest not only behaviour change results (i.e., increased number of food donations/collections via the app) but also positive environmental impacts (Makov et al., 2020). More specifically, a food/non-food sharing mobile application named OLIO was introduced initially to reduce food waste, but then it was extended to non-food household items (e.g., books, clothes, appliances) to decrease general waste (OLIO, 2021).

OLIO was launched in 2015 in the UK and has been used in 51 countries, including North and South America. Quantitative measures of OLIO's impact in the UK show that it has facilitated the sharing of over 6.5 million food portions, saving 19.3 million car miles and one billion liters of water (Clarke, 2020). Additionally, the platform has been reported to help supplement diets during times of financial crisis (Harris, 2017).

In 2018, the OLIO app gained significant visibility in Colombia through high-profile national and local newspapers (El Espectador, 2018). Nevertheless, the extent of its popularity in the country still lacks extensive examination. At present, subscription rates reveal a user base surpassing 350,000 active users, specifically in Bogota. However, given

the city's population of approximately 8 million inhabitants, the number of users appears comparatively low (4.3%).

Despite OLIO's positive outcomes, a comprehensive examination of the factors influencing user engagement with the Olio app in both developed and developing countries remains incomplete. This investigation is crucial for expanding the app's global reach and gaining insights into the mechanisms that drive behavioural changes.

Importantly, the currently available evidence on food-sharing apps lacks a behaviour change theoretical grounding to better inform about factors influencing engagement. Hedin et al. (2019) findings indicate that previous studies on digital interventions for sustainable food consumption are primarily centered around the implementation of the proposed solution, rather than on evaluating how and why behavioural change(s) occurred, or why these changes are sustained by applying theories of behaviour change.

The current study

The current study aimed to identify facilitators and barriers to engagement with the Olio app for sharing items to better understand how to increase the use of Olio as an alternative to reduce solid waste in Bogota. We selected the COM-B model (Michie et al., 2014) as it is a behavioural science model that can be used to understand the influences on engagement and help us classify these influences and guide recommendations to help increase intervention effectiveness across different contexts.

The COM-B model (Michie et al., 2011) posits that behaviour results from the interaction between three components: capability, opportunity, and motivation. Capability refers to an individual's psychological and physical ability to engage in a behaviour. Opportunity refers to external factors including social and physical resources that make a behaviour possible. And motivation encompasses both, reflective process involved in making plans and automatic processes such as impulses and inhibition that influence decision-making and behaviour (Michie et al., 2011). Thus, by identifying which of the COM-B components are the drivers of behaviour, interventions can target the relevant factors that bring about the desired behavioural changes.

Methods

This study employed an exploratory sequential mixed methods research design that combines qualitative and quantitative data collection methods and analysis in a sequence of phases (Creswell & Plano Clark, 2011). This approach was deemed suitable due to a lack of prior research on engagement with mobile apps in this field. Interviews served as an

initial scoping of the factors that participants found either motivating or challenging with this app (qualitative component). Subsequently, a survey was conducted to further investigate these factors with a larger sample and assess which of them significantly influenced engagement (quantitative component).

Interviews

Sample and recruitment

Four OLIO users and three OLIO non-users were interviewed and recruited through opportunity sampling. OLIO users were reached via the OLIO app forum where participants expressed their interest in the study by responding to an invitation message posted on this forum, while OLIO non-users were recruited through the lead author's social media networks. Those who agreed to be interviewed were given a 7 USD gift card (30,000 COP) from a grocery store as compensation for their time. The inclusion criteria for OLIO users were 1) being 18 years old and over, 2) being citizens of Bogota, 3) having shared at least 5 times with other OLIO users either by donating or receiving articles, and 4) having access to online platforms such as Teams or Zoom to be interviewed. The inclusion criteria for OLIO non-users were 1) being 18 years old and over, 3) never having used the OLIO app, 3) being citizens of Bogota, and 4) having access to online platforms such as Teams or Zoom to be interviewed. Table 1 presents the demographic characteristics of participants. The total number of interviews conducted enabled us to reach data saturation.

Procedures

All interviews were conducted by the lead author. Recruitment and all subsequent communication with OLIO users were conducted via the app, beginning with a brief advert about the study to all OLIO members. Participants were sent additional information about the study, the consent form, and joining instructions for the interview. In the case of OLIO non-users, if they have never heard about the existence of

OLIO, a short video introducing the app was presented. All interviews were conducted online via Zoom and written informed consent was obtained before each interview for participation and recording of the interview. On average interviews lasted about 35 min. At the end, participants were thanked and given the gift card code to be used at the grocery store. The recordings were transcribed verbatim and anonymized.

Measure

The interview for OLIO users included questions about their knowledge of the OLIO app objectives and utility, the reasons to start and keep using the app, the app use frequency, and how it could be improved. OLIO non-users answered questions about the more and less attractive app features, the intention to use the app in the future, and the reasons behind this answer. All interviews were made and transcribed in Spanish as this is the official language of Colombia, although two of the transcripts were translated into English to facilitate intercoder reliability (ICR).¹ The complete interview schedule is given in OSF [Online Resources](#).

Data analysis

The lead author (a Spanish native speaker) transcribed all interviews in full and entered transcriptions into NVIVO-12 for data organisation and analysis. Following a Thematic Analysis approach, data was first coded inductively allowing meaning to emerge from participants' perspectives as this was the exploratory component of the overall study. Codes were attached to these phrases and labelled with verbatim words from the participants' narratives according to the "In Vivo" procedure of Saldaña (2016). After theme extraction, these themes were categorised as barriers and facilitators to engaging with the app. Inter-coder reliability was carried out with a second coder (LE) reaching very high agreement (89%).

Interviews results

Barriers and facilitators to engagement with the OLIO app

Nine broad themes emerged relative to specific barriers to engaging with the Olio app. Participants highlighted

Table 1 Interview participants' demographic characteristics

Participant's name (pseudonym)	Role	Age	Time using the Olio app
Catalina	Olio user	21	3 Months
Andrea	Olio user	30	4 Months
Jeff	Olio user	26	3 Months
Aleja	Olio user	19	4 Months
Jose	Olio non-user	39	0
Albert	Olio non-user	56	0
Lorena	Olio non-user	28	0

¹ To assess the reliability of the coding, two interviews were double-coded by a second coder (LE). However, as it was not feasible at the time of the study to find a coder who was familiar with the COM-B model, and was fluent in Spanish, it was deemed necessary to translate these interviews into English. Therefore, intercoder reliability was calculated with the English version of two transcripts.

the “Fear of malicious users” (17 references²), secondly “Little incentives for donors” (12 references), and in the third place “Few users around the neighborhood” (10 references). These barriers and other difficulties were mapped to COM-B as specified in Table 2.

The specific barriers to using the Olio app were mostly related to “automatic motivation” and “physical opportunity”, whilst the COM-B components unreported were “reflective motivation” and “physical capability”. A detailed description of each theme is presented in OSF Online

Resources Table 5 (Themes regarding barriers to engaging with the OLIO app).

Seven themes were identified as facilitators that help users either start or continue to use the Olio app. The most prominent were the following: “Having an altruistic or pro-social personality” (20 references³); “Perceived social benefits” (18 references); and “Satisfaction while helping those in need.” (16 references). All facilitators were deductively mapped to COM-B as specified in Table 2.

Contrary to barriers, facilitators to use the Olio app were mostly grouped under three COM-B components: reflective

² The number of times that a specific theme appears in all data set.

³ The number of times that a specific theme appears in all data set.

Table 2 Specific barriers and facilitators to engage with OLIO app related to COM-B components

Themes on specific barriers / facilitators	Barrier / Facilitator	Description	References	COM-B component
Fear of malicious users	Barrier	Afraid of being mugged by the collector or donor	Li et al., 2019	Automatic motivation
Uncertainty about what OLIO owners do with users' personal information	Barrier	Afraid of sharing too much personal info over the app	Dong et al., 2021	
Little incentives for donors	Barrier	Little room for incentives to encourage donations	Guzmán Rincón & Carrillo Barbosa, 2021	
The understanding of the app functionality	Barrier	A lack of clarity on how the app works	Diaz et al., 2020	Psychological capability
OLIO is a tool aimed at poor people	Barrier	The belief that Olio is mainly to help people in need	Cortes & Gámez, 2019	
There are more collectors than donors	Barrier	Users care more about collecting than donating	Dong et al., 2021	Social opportunity
Communication problems among users	Barrier	Some users show little respect or are rude to other users	Clarke, 2020	
Notifications of new items take a long time to be received	Barrier	The app does not send alerts on the new items immediately after they are published	Espectador, 2018	Physical opportunity
Few users around the neighborhood	Barrier	Users need to travel long distances to collect items given the few people using the app	Farr-Wharton et al., 2014	
Having prosocial values	Facilitator	Someone who likes sharing/helping others or has empathic concerns	Makov et al., 2020	Reflective motivation
Perceived social and personal benefits	Facilitator	Positive outcomes on individuals/others, generated using Olio	Liu & Li, 2021	
Satisfaction while helping those in need	Facilitator	A feeling of pleasure derived from helping others	Kaza et al., 2018	Automatic motivation
Satisfaction when checking that the app works as promised	Facilitator	A feeling of pleasure when a favourable outcome occurs after using the app	Harris, 2017	
Ratings contributes to the users' trust and confidence	Facilitator	Ratings is a source of information about Olio users' behaviour	Dong et al., 2021	Social opportunity
The more people using the app the more influence to use it	Facilitator	The widespread use of Olio contributes to its reliability	Hedin et al., 2019	
Offers an easier way to share items	Facilitator	Olio provides the opportunity to reach people with specific needs, and to save efforts when sharing	Espectador, 2018	

motivation, automatic motivation, and social opportunity. The description of each theme supported by quotations is shown in OSF Online Resources Table 6 (Themes regarding facilitators to engage with the OLIO app).

Recommendations to improve the experience when using the olio app

Olio users highlighted the importance of including new options or modifying existing ones in the app to improve the experience of using Olio. Although these suggestions were not identified as barriers or facilitators to start or maintain the app usage, these would likely enhance users' experience or the involvement of potential users in the context of Bogota. The suggestions were mapped to COM-B and are summarized in Table 7 presented in OSF Online Resources (Factors likely to enhance the Olio app users' experience).

Survey

Sample and recruitment

The quantitative component involved a self-completed anonymous online survey with 260 participants from the general public selected through non-probability sampling.⁴ A social media campaign through the lead author's social media networks (Facebook, Instagram, LinkedIn), as well as snowballing, was used to invite people to take an anonymous 10-min online survey on the use of OLIO app. The hyperlink directed participants to the study description and consent, and the questionnaire. The inclusion criteria for survey respondents included only one requirement: to live or have lived in Bogota. Most respondents were living in the localities of Usaquen and Suba.

Procedure

Data was collected via an online brief questionnaire and gathered through Qualtrics. Participants opting to take part in the study were shown a message indicating that their contribution was anonymous and that proceeding to the survey and submitting the full set of responses signifies giving consent to the data collection. Participants took on average seven minutes to complete the entire survey.

⁴ Using a probability sample method was not feasible due to cost and pandemic circumstances that restrict access to people. Initially, the number of participants was estimated based on a small effect size of 0.2, significance level (α) of 0.05, and power 0.9. However, the sample size given, a total of 327 participants, was not achievable. Then, the sample size was estimated based on the general rule of thumb that states no to have less than 50 participants for a correlation or regression analysis.

Measure

The survey was designed based on the interview findings that guided the selection of the COM-B components to be assessed. The final version of the survey consisted of a list of 23 questions. Each item was measured on a five-point Likert scale, ranging from "strongly disagree" (1) to "strongly agree" (5). It contained questions such as how important was to reduce waste of used items, how much effort took to share things with other citizens, how likely was to do this, whether friends or family influenced sharing things through the app with others, and whether incentives motivate the use of the app. The survey also included sociodemographic questions (age, level of education, and area of residence) that could affect the uptake of the app. All survey questions were presented to participants in Spanish (the complete survey schedule can be accessed in OSF Online Resources). Cronbach's alpha test was used to provide a measure of the internal consistency of each of the COM-B components evaluated, it ranged from 0.30 to 0.55. (A summary of the level of consistency per component can be found in OSF Online Resources Table 11 Quantitative survey description).

Data analysis

Quantitative data was analysed using descriptive statistics (frequency of responses), the Spearman's rho rank correlation coefficient was used to measure significant associations among barriers/facilitators and the intention to use the app. A multivariate linear regression model was fitted to the data to determine predictors of intentionality. All data was analysed in Stata/MP 17 and Microsoft Excel.

Results of the surveys

A total of 260 participants completed the survey. The majority of respondents were aged 21 to 50 (85% of the sample) and 87.3% completed an undergraduate degree. Only 17 respondents reported knowing the Olio app. Table 8 presents the participants' demographic characteristics found in OSF Online Resources.

Predictors of the intention to donate and collect used items using a mobile app

Multivariate regression analysis was used to determine which of the variables predicted the intention to donate and collect through a mobile app, considering as independent variables sociodemographic characteristics and only those barriers/facilitators that expressed a significant correlation with intentionality. (The correlation matrixes used

Table 3 Summary of regression analysis for variables predicting the intention to donate via app

Variable	Model 1			Model 2		
	<i>B</i>	<i>SE B</i>	<i>b</i>	<i>B</i>	<i>SE B</i>	<i>b</i>
Age	0.01 [-0.11, 0.13]	0.06	0.01			
Education	-0.02 [-0.15, 0.11]	0.07	-0.02			
Having environmental concerns	0.18 [0.018, 0.34]	0.08	0.13*	0.20 [0.005, 0.35]	0.08	0.14*
Considering important to avoid waste of used items	0.08 [-0.11, 0.28]	0.10	0.05			
Considering important to avoid unnecessary shopping	-0.02 [-0.17, 0.14]	0.08	-0.01			
Knowing how to use mobile apps	0.24 [0.08, 0.39]	0.08	0.20**	0.23 [0.009, 0.36]	0.07	0.19**
Considering difficult to share used items through a mobile app	-0.20 [-0.30, -0.10]	0.05	-0.23***	-0.22 [-0.31, -0.11]	0.05	-0.25***
Feeling guilty of throwing used things in the trash	0.06 [-0.03, 0.16]	0.05	0.08			
Feeling good of donating things	0.21 [0.04, 0.37]	0.08	0.16*	0.25 [0.10, 0.40]	0.08	0.19**
Feeling afraid of sharing via app in Bogota	-0.00 [-0.10, 0.10]	0.05	-0.00			
Considering mobile apps to share used items to be widely disseminated on media	0.13 [0.03, 0.23]	0.05	0.15*	0.12 [0.03, 0.22]	0.05	0.15*
Having no time to collect a used item in others' location	-0.07 [-0.17, 0.03]	0.05	-0.08			
R ²		0.21			0.19	
Adjusted R ²		0.17			0.18	
F		5.47***			10.33***	

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. The confidence Interval for B is indicated in square brackets

Table 4 Summary of regression analysis for variables predicting the intention to collect via app

Variable	Model 1			Model 2		
	<i>B</i>	<i>SE B</i>	<i>b</i>	<i>B</i>	<i>SE B</i>	<i>b</i>
Age	-0.02 [-0.18, 0.13]	0.08	-0.02			
Education	0.07 [-0.09, 0.24]	0.08	0.05			
Having environmental concerns	0.25 [0.04, 0.46]	0.10	0.14*	0.32 [0.13, 0.52]	0.09	0.18**
Considering important to avoid waste of used items	-0.09 [-0.35, 0.16]	0.12	-0.04			
Considering important to avoid unnecessary shopping	0.14 [-0.05, 0.34]	0.10	0.09			
Knowing how to use mobile apps	0.21 [0.02, 0.41]	0.09	0.14*	0.21 [0.04, 0.39]	0.08	0.13*
Considering difficult to share used items through a mobile app	-0.17 [-0.31, -0.05]	0.06	-0.16**	-0.20 [-0.33, -0.07]	0.06	-0.18**
Feeling guilty of throwing used things in the trash	0.06 [-0.05, 0.20]	0.06	0.06			
Feeling good of donating things	0.15 [-0.05, 0.37]	0.10	0.09			
Feeling afraid of sharing via app in Bogota	-0.03 [-0.17, 0.01]	0.06	-0.03			
Considering mobile apps to share used items to be widely disseminated on media	0.27 [0.15, 0.41]	0.06	0.25***	0.29 [0.17, 0.42]	0.06	0.27***
Having no time to collect a used item in others' location	-0.18 [-0.31, -0.06]	0.06	-0.17***	-0.19 [-0.32, -0.07]	0.06	-0.18**
R ²		0.20			0.18	
Adjusted R ²		0.16			0.16	
F		5.36***			11.08***	

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Confidence Interval for B indicated in square brackets

to generate the regression model can be found in the OSF Online Resources as Tables 9 and 10). Table 3 presents the regression analysis taking as the dependent variable the intention to donate used items, while Table 4 shows the regression to collect used items. Model 1 includes all variables that exhibited strong correlations in the correlation analysis. Model 2 only includes predictors that are significant in Model 1.

Model 1 in the above table shows that only five variables are significant in their relationship with the intention to donate using a mobile app. Model 2 indicates that “Considering difficult to share used items through a mobile app” was the strongest negative predictor of intention ($\beta = -0.25$, $p < 0.001$). This means that for every unit of increase in “perceived difficulty”, there is a decrease of 25 points in predicted intention to donate via the app. Approximately

20% of the variability of intention to donate is accounted for by the five variables in model 2 compared to model 1 (17%).

As can be seen from Table 4, Model 1 explains a little more of the variability of “intention” (17%), compared to Model 2 (16%). Unlike the intention to donate, Model 2 indicates that “Considering mobile apps to share used items to be widely disseminated on media” was the strongest predictor of the intention to collect via Olio. Specifically, in terms of the standardised coefficients, we would expect an increase of 27 points on the scale in the “Intention to Donate via the app” score for every unit of increase in “perceived dissemination of mobile apps to share items”.

Discussion

This study aimed to develop a comprehensive understanding of barriers and facilitators to engaging in sustainable behaviours such as used items sharing using the OLIO mobile app, among Bogota citizens. Sharing used items via an app involves two behaviours, item donation and item collection, each influenced by different barriers and facilitators. However, the primary finding of this study is that key factors significantly contribute to the likelihood of performing both behaviours. These factors include the app management knowledge, perceived app usage difficulties, media dissemination of the Olio app, and environmental concerns.

The main findings are discussed below and organized according to the COM-B components. Additionally, strategies for enhancing engagement with the Olio app are provided.

Capability: app management knowledge

This research found that understanding the Olio app features and how it works facilitates engagement with the app, in fact, the lack of understanding could be a potential barrier to using Olio. The survey item “knowing how to use mobile apps” accounted for the variability in intentions to donate (23%) and collect via apps (21%). In other words, *knowledge* significantly predicts the use of an app like Olio both for donating and for collecting items. This result reflects those of prior studies (Szinay et al., 2021) which also emphasize that engagement with health apps is considerably influenced by factors affecting users’ capabilities such as the app information and guidance.

Additionally, considering the proportion of survey participants over 50 years old who report the intention to donate (10,8%) and collect (8,8%) via apps, it would be wise to implement tailored information and supporting strategies enabling this population to use Olio. In line with the latter, interviewees using the app suggest having an onboarding

video and permanent customer support from Olio administrators, which will effectively alleviate the burden of help requests being posted on the Olio app forum daily.

The desire for customized information and support in using apps has previously been described in other studies addressing the uptake of digital health tools. For instance, Madanian et al. (2023) found that personalization was one of the key factors that contributed to patient engagement with eHealth tools. According to the authors, personalization involves the creation of an interface, content, recommendations, and interactions that are relevant and appealing to the user or segments of users.

Therefore, implementing measures that enhance users’ knowledge and skills in utilizing the Olio app, tailored to their diverse needs and preferences, is likely to positively influence the motivation of potential users to engage with this app.

Opportunity: perceived app usage difficulties

In terms of physical opportunity, the perceived difficulty in sharing items via the app was found to be a barrier to using Olio based on the survey results. Similarly, the “perceived lack of time to collect items” in the survey, which was expressed by interviewees as “*few users around the neighbourhood*”, was found to negatively impact the uptake of Olio. The larger the distance between donor and receiver, the longer the time required to travel, and the less likely an individual uses Olio. Former research indicates that longer distances to recycling facilities, task difficulty, and perceived risks deter people from sorting and reusing most recyclable wastes (Fogt Jacobsen et al., 2022; Li et al., 2019).

On the other hand, one key facilitator related to psychological opportunity included “Considering mobile apps to share used items to be widely disseminated on media”. Survey results suggest that increased advertising about the app has a strong influence on the decision to collect used items via Olio. Likewise, both Olio and non-Olio users interviewed believed that media campaigns could boost Olio’s awareness and credibility among the sceptical population. These findings echo previous studies indicating that population exposure to environment-related media messages, favours the adoption of climate-protective behaviours by shaping people’s environmental concerns, strengthening their environmental knowledge, and increasing perceived personal responsibility (Liu & Li, 2021; Shah et al., 2021).

To address the perceived inconveniences using Olio (e.g., time, distance) several actions could be considered. In the first place, it is crucial to undertake media campaigns to generate awareness of and confidence in the app, thereby increasing the number of users in each Bogota locality. Also, add shipment methods for long-distance donations.

Additionally, forge strategic partnerships with relevant organizations such as supermarkets, clothing shops, churches, and small local vendors, to amplify the availability of used items on the app, as well as enhance its visibility. Lastly, allow users to provide qualitative feedback on other users' profiles to increase confidence among members. This can help users feel more secure and fearless about travelling longer distances to collect a desired item.

Motivation: environmental concerns

The intention to use Olio both for donating and collecting used items might be influenced by environmental concerns, according to our survey respondents. This finding confirms the results of a previous study conducted with Colombian college students (Diaz et al., 2020), which showed a positive correlation between climate change knowledge/concerns, and the performance of environment-protective behaviors (PEBs) measured through declared behaviors and intentions to engage in PEBs.

However, the translation of environmental concerns into different pro-environmental behaviors is still a matter of inquiry. For instance, in a recent survey conducted by Guzmán Rincón and Carrillo Barbosa (2021), 393 Colombian respondents were grouped into two clusters. The first cluster comprised 224 participants (57% of the total sample) who showed less willingness towards paying more for eco-friendly products and were less likely to reuse products in comparison to the second cluster, despite expressing significant concerns for climate change and the environmental impact of their consumption habits. The second cluster (43%) was characterized by practicing more sustainable consumption.

Based on two research studies Dong et al. (2021) suggest a potential solution to bridge the gap between environmental concerns and actual behaviors. They propose that triggering a subjective sense of power, which refers to personal feelings of control and autonomy, can increase pro-environmental individuals' willingness to take action. The authors found that people with strong nature-protecting values were more likely to donate their time and money to an environmental cause when they felt empowered and autonomous.

Given that environmental concerns could increase the use of Olio among non-users, media campaigns may have a larger impact, if framing messages appealing to Olio's environmental benefits and the personal ability to produce environment-positive changes.

Comparisons between interviews and survey results

When comparing the results of the interviews with the survey results, similarities and differences emerged. Concerning

the barriers to using the Olio app in the context of Bogota, only two barriers frequently reported in the interviews were found to be significantly associated with intentionality in the survey. Specifically, "few users around the neighbourhood" (physical opportunity) and the "lack of understanding about the Olio app features" (psychological capability). Additionally, one of the interviewees' suggestions related to "Increasing advertising to attract new users" was found to be the strongest predictor of the intention to collect used items by using an app.

Regarding enablers to using the Olio app, survey results were consistent with two of the interview findings. First, "the convenience of sharing items through the app" (physical opportunity), and second, "experiencing satisfaction while helping those in need" (automatic motivation).

Surprisingly, some of the key interview findings were not confirmed by the survey results like the "Fear of malicious users" and "having more incentives to donate via app".

Limitations and future research

The exploratory study must be considered within the context in which it was conducted, and therefore, it is important to acknowledge some limitations. One of these was the limited representation of OLIO users included in the survey. A larger representative sample of Olio users within the survey might have yielded different insights.

Secondly, we measured the intention to share items through apps, as it was not feasible to measure actual sharing (i.e., the behaviour), and given the well-known intention-behaviour gap, these results should be considered with caution (Snichotta et al., 2014). However, the intention to practice a behaviour is still a valuable measure pinpointing to factors that must be modified to achieve behavioural changes.

Finally, upon careful analysis of the survey reliability, the automatic motivation and social opportunity scales had the lower scores. The social opportunity scale is compromised due to its limited number of questions, whereas the automatic motivation scale lacks correlation between its items. Therefore, we recommend approaching the results with caution to ensure precise interpretation and informed decision-making.

Although this study was conducted in the context of Bogota, the findings of this research can provide some useful insights about engagement with the OLIO app and other similar digital apps. Our recommendations can also provide the basis for future studies aiming to evaluate intervention development to increase usage of the app.

Implications

This study has provided a comprehensive understanding of barriers and facilitators to engagement in sharing used items through mobile apps, using the COM-B model. Results derived in a series of implementation strategies which, if implemented, could increase the chances of sharing used items via app among Bogota citizens. Additionally, this study has demonstrated the utility of applying an evidence-based model of behaviour change, to identify, analyse, and organize the reasons behind the decision to use or continue using items sharing applications.

Considering that less than 7% of people participating in the survey knew about Olio, and that surveyed as well as interview participants believe that Olio app dissemination influences app usage, more efforts on media campaigns are recommended targeting individuals as well as companies.

Finally, these findings have important implications for national waste reduction strategies. The Colombian Ministry of Environment and Sustainable Development launched the “National Circular Economy Strategy” for the period 2018–2022, through which it was expected to minimize the amount of solid waste. The circular model initiative extends the useful life of products and materials and avoids their final disposal as waste, by reinforcing sustainable ways of consumption such as reducing, reusing, recycling, and recovering materials.

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Data availability The dataset generated during and/or analyzed during the current study are available in the [OLIO Data set and Code Dictionary] file, at: <https://osf.io/684cs/>

Declarations

Institutional review board Ethical approval was obtained from the UCL ethics committee under the category of Low-Risk Research Project. The project is registered under reference No Z6364106/2021/03/131 social research in line with UCL’s Data Protection Policy.

Informed consent Informed consent was obtained from all individual

participants included in the study.

Patents There were no patents resulting from the work reported in this manuscript.

Conflicts of interest The authors have no affiliations or involvement of any kind with OLIO, neither financial interests nor non-financial interests. The authors declare no conflict of interest.

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