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Building customer citizenship behaviour through mobile application quality: the mediating role of flow experience and customer engagement

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ABSTRACT

Mobile applications have become an indispensable marketing medium for tourism companies. Given that half of the users delete the applications soon after completing their transactions, it is vital to improving the application quality based on the users' expectations. Thus, drawing on the Stimulus–Organism–Response theory, this study investigates the determinants of customer citizenship behaviour related to mobile travel applications. It is a type of value co-creation behaviour, including sharing feedback with the company to help improving its service provision. The analysis results of 315 data collected from travel application users revealed that flow experience and customer engagement, which are affected by mobile application quality, are strong determinants of customer citizenship behaviour. Alongside with the discussion of the findings, the theoretical and managerial implications are also provided.

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Mobile application quality; flow experience; customer engagement; customer citizenship behaviour

1. Introduction

Smart technology tools (e.g. smart devices, Internet of Things) provide a great deal of support to people in their daily life (Buhalis, 2020). As a type of smart technology, the use of mobile phones and mobile applications (apps) is constantly increasing (Exploding Topics, 2023). Today, an average person uses a mobile phone 3 h and 15 min in a day (Exploding Topics, 2023), 91% of which is spent on apps. The 2.87 million apps available on the Google Play Store show that the increasing user interest in mobile apps also creates an opportunity for companies to directly reach potential or existing customers, offer them tailored services, and collect data about their preferences (Ho & Chung, 2020). Therefore, mobile apps have become an important customer-brand touchpoint for companies. In the context of tourism and travel, global statistics underline how large the size of user market is towards travel-related mobile apps. In 2021, slightly one billion travel app users made \$613 bn online travel bookings (Businessofapps, 2023). Booking.com is the leader of online travel agency apps with 80 million downloads (Ftnnews, 2023), followed by Airbnb (52 m), and Expedia (27 m).

Having a popular and successful mobile app is a challenging mission for companies, as scientific research shows that half of the users tend to delete the app after completing their task (e.g. purchase) (Ali et al., 2021). This reflects the fact that although mobile app adaption among users is high (i.e. selection of an app for use), engagement behaviour is lacking (i.e. continued usage of

app) (Fang et al., 2017; Tak & Gupta, 2021). Therefore, investigating the factors leading to customer engagement (CE), which is defined as the user's continuous interaction with a mobile app (Ali et al., 2021) is worthwhile and necessary. However, despite numerous calls for research (e.g. Rasool et al., 2020; Hollebeek et al., 2022), there is still a dearth of research addressing CE in the context of mobile apps.

In previous studies, satisfaction and emotion were identified as the two tenets of the CE (Pansari & Kumar, 2017). In the use of mobile apps, while app quality determines satisfaction (Lin et al., 2023), experiencing flow reflects positive emotion (Ding & Hung, 2021). Scholars have recently begun to consider mobile app quality (MAQ) and flow experience (FE) as determinants of CE. However, prior studies are fragmented and provide inconclusive results. For example, Ali et al. (2022) found support for the effect of hotel app quality on FE and user engagement, while their model did not support the impact of FE on user engagement. Moreover, one of the common characteristics of these studies is to focus on behavioural intention construct (e.g. booking intention) as the main outcome of CE (Ali et al., 2022) and to ignore other consequences like providing suggestions for the company to improve its services.

Drawing on service-dominant logic which assumes customers as the co-creators of service, researchers have confirmed the vital importance of the extra role behaviour of customers in the value co-creation (Meng & Cui, 2020). Recently, customer citizenship behaviour (CCB), being a type of customer value co-creation behaviour, has attracted widespread interest from researchers (Jung & Yoo, 2017). CCB comprises some voluntary behaviours, such as sharing positive experiences with friends or colleagues, assisting other customers and company employees, tolerating service failures, and providing feedback to the company in improving its services (Dang et al., 2020). Despite these advantages reflecting that CCB is at least as important as actual purchasing behaviour, the concept of CCB has received a lack of attention in previous mobile application studies.

The above-mentioned research gaps highlight the necessity of a comprehensive study that aims to explore the antecedents of CCB in the mobile apps context. Therefore, by adapting Stimulus–Organism–Response (SOR) theory, this study aims to identify the relationships among MAQ, FE, CE, and CCB in a holistic research model. Specifically, the objectives of this study are three-fold: (1) to determine the effect of MAQ on both FE and CE which are derived from mobile travel app use, (2) to estimate the influence of FE on CE, (3) to investigate the impacts of FE and CE on CCB related to a mobile travel app.

Some of the expected contributions of this study are as follows. First, this empirical study enriches the literature by providing an insightful understanding of user behaviour related to mobile travel apps. Unlike most extant research that handles behavioural intention as an outcome of CE, this research particularly focuses on CCB as the main behavioural outcome. In such an era of advanced technology, in which the use of mobile travel apps is predicted to increase gradually due to many internal and external factors affecting user behaviour (e.g. COVID-19), this study may contribute to predicting how the quality of mobile apps creates CCB. Moreover, to the best of the authors' knowledge, this research is among the first that investigates together the influence of CE and FE on CCB. This specific research objective will allow to understanding the connection between some future behaviours of mobile travel app users, such as CCB, and some emotional experiences, such as flow. Last, the present study broadens the literature by investigating the mediating roles of CE and FE in the MAQ-CCB relationship, since both variables' mediating impacts on user behaviours were rarely examined in the tourism literature.

2. Theoretical background

2.1. Stimulus–organism–response theory

The Stimulus–Organism–Response (SOR) theory proposes that environmental factors (stimulus) trigger the emotional state of people (organism) and this leads to some behavioural consequences (response)

(Mehrabian & Russell, 1974). The SOR, as an important framework for understanding tourist behaviour, has been used in various tourism-related fields, such as food festivals (Hsu et al., 2021), solo travels (Yang et al., 2022), virtual reality tourism (Kim, Lee, et al., 2020), and mobile travel apps (Wu et al., 2021). Since the SOR theory has a comprehensive framework in explaining tourist behaviours in the digital context, this study adapts it to examine travellers' mobile app use behaviours. The MAQ, which consists of system quality, information quality, and service quality dimensions, was considered as a stimulus. Since CE and FE reflect travellers' emotional and cognitive attitudes towards mobile apps, they served as an organism. The CCB was examined as a response to FE and CE.

2.2. Mobile application quality

Since the perceived quality of a mobile app determines the users' intention to download it (Bhandari et al., 2017), the measurement of MAQ was attracted considerable interest from the researchers. One of the early attempts for the evaluation of MAQ and identification of its determinants in the tourism literature belongs to Gibbs et al. (2016), who examined 24 North American branded hotel mobile apps. They found 11 hotel app features that might enhance customer experiences. For example, *personal concierge services* feature was shown to create personalized experiences. Choedon and Lee's study (2018) on mobile tourism apps showed that *geo-location map*, *multilingual option*, and *compatibility with different operating systems* were the features that affect user satisfaction/dissatisfaction. Recently, Sia et al. (2022) identified the *geolocation tracking services*, *travel itinerary generators*, and *real-time personalization & recommendation* as the smart features after reviewing 443 mobile travel apps. However, these studies followed a technology developer-based perspective in the determination of the main mobile app features.

Following to Zeithaml's (1988) conceptualization of quality from the customers' perspective, some researchers attempted to measure mobile app quality based on the users' perspective. For example, Lee and Han (2022) empirically demonstrated that food delivery app quality is determined by *information usefulness*, *design aesthetics*, and *technology excellence* dimensions. Their results revealed that users' perception of the app quality has an indirect effect on brand satisfaction via perceived value.

The information system success model (DeLone & McLean, 2003) was also used as a theoretical framework by some researchers for the assessment of mobile application quality. For instance, Ali et al. (2021) found out that travel-related MAQ consists of *system quality*, *information quality*, and *service quality* dimensions. These dimensions were shown to determine user engagement which influences behavioural intention via mobile app satisfaction. Similarly, Albayrak et al. (2023) used the information system success model to measure the travel-related MAQ. Their study results indicated that MAQ is the direct antecedent of perceived ease-of-use and perceived usefulness, where they represent the strong determinants of intention-to-use the mobile apps.

2.3. Flow experience

The flow theory explains the psychological state of people when they are fully concentrated on activity and lost time perception (Csikszentmihalyi, 1975). Flow can be experienced not only in work or leisure time but also in the daily routine of life (Csikszentmihalyi & Csikszentmihalyi, 1988). Flow is an optimal experience, which generally characterizes the activities from a hedonic perspective (Ding & Hung, 2021). To date, the flow theory has been extended by examining its usage in different domains such as websites (Wu et al., 2014), rafting (Wu & ve Liang, 2011), and mountain climbing activities (Tsaur et al., 2013). FE research in the mobile app has emerged, more recently. In the limited number of research on flow with mobile app use, scholars have associated flow with learning a second language (Lu et al., 2022) and instant messaging (Dhir et al., 2020). However, the number of the studies that relate flow to mobile travel apps are rather scarce. In one of these studies, Ali et al. (2022) provided evidence on the positive impact of FE on users' booking intentions through mobile apps.

2.4. Customer engagement

CE is defined as a psychological state that occurs as a result of interaction and co-created customer experiences with a company/brand (Brodie et al., 2011). For van Doorn et al. (2010), CE signifies the customers' behavioural manifestation toward a company/brand going beyond the basic and traditional transactions, like purchasing. Engaged customers to a company or a brand are expected to exhibit some non-transactional manifestations, such as making recommendations, developing customer-to-customer interactions, blogging, writing reviews, searching information about the company's products/services, and interacting with employees (Van Heerde et al., 2019). These behaviours reflect the customers' readiness and willingness in actively interacting with company/brand through various (physical/virtual) touchpoints (Rasool et al., 2020).

In the field of mobile apps, CE is determined by the continuous interaction of customers with a mobile app (Fang et al., 2017). Interestingly, previous study results showed that most users delete mobile apps from their mobile phones immediately after completing the purchasing task (Tak & Gupta, 2021). Therefore, maintaining CE for branded mobile apps is a challenge for the companies. As noted by Vogel et al. (2008), a branded mobile app is a strategic communication tool of companies for promoting brand identity and enhancing customer-brand interactions. If previous service experiences and brand knowledge of the customers are positive, they can be motivated easier to increase pre-existing brand relationships and develop proactive commitment via company's mobile app.

2.5. Customer citizenship behaviour

The concept of CCB, which was first introduced by Bettencourt (1997) based on the theory of organizational citizenship behaviour, basically refers to voluntary customer behaviours towards a company, with the aim of contributing to its creation of extra value and improving the service quality. When customers have good service and brand experiences with a company, they tend to help the company and its other customers (Xie et al., 2017). CCB heavily depends on customers' previous service experiences, satisfaction, perceived values, attachments to the company brand, and relationships with the brand community (Cheng et al., 2016). Some basic indicators of CCB in the services industry were identified as to providing feedback to the company, making recommendations, helping other customers, displaying relationship affiliations, participating in company activities, joining benevolent acts related to service facilitation, and showing flexibility (Gong & Yi, 2021; Šegota et al., 2022). These are voluntary, engaged, and extra-role behaviours of the customers, which are not directly related to purchasing (Nguyen et al., 2014).

In the tourism and hospitality literature, research results indicate that customer experience, perceived value, and brand/customer loyalty are the main determinants of CCB intention (Samsa, 2022). Moreover, CE is shown to play a mediating role in the relationship between servicescape and CCB in the hospitality context (Li & Wei, 2021). However, to the best of the authors' knowledge, no studies in the tourism literature have yet examined the direct effect of FE and CE on CCB in the context of mobile tourism app usage.

3. Hypothesis development

3.1. Relationship between mobile application quality and customer engagement

MAQ affects the users' emotional responses that are closely related to some psychological variables (Bhandari et al., 2017). When the quality of the mobile app is perceived as high, the attitudes and behaviours of the users will be positively affected, which will lead to an increase in their engagement (Ali et al., 2021). For instance, *easy-to-use*, *well-designed*, *facilitating*, and *playful* system structures can impact users' interest and intention to adopt mobile tourism apps (Tan et al., 2017). These kinds of

quality attributes may act as a stimulus on user engagement with mobile travel apps. Therefore, perceived MAQ plays an important role in developing CE. Particularly mobile apps' *information quality*, *visual*, *design solution*, *navigation*, *information*, and *collaboration design* functions significantly increase CE (Tarute et al., 2017; Tak & Gupta, 2021). Thus, the first hypothesis of this study is proposed as follows:

H1: Mobile application quality influences customer engagement.

3.2. Relationship between mobile application quality and flow experience

It has been widely recognized in both relevant industries and academia that building FE is important to the success of mobile applications. This is mainly because user experiences with mobile apps are heavily influenced by flow (Smith & Chen, 2018). Companies, therefore, tend to constantly modify the features of the mobile apps to foster the flow state of the users. In the social media context, the information and system quality of mobile apps improves the flow perception, which leads to CE (Kim, Yoo, et al., 2020). The impact of MAQ on FE is also supported in the hotel context by Ali et al.'s study (2022). However, they recommended to verify their study results by face-to-face data collection, as they prefer to collect data online. These results derived from the related literature generate a necessity for the confirmation of the impact of MAQ features on the users' FE. Hence, the second hypothesis of this study is proposed below:

H2: Mobile application quality influences flow experience.

3.3. Relationship between flow experience and customer engagement

Tourism companies mostly benefit from mobile apps in building relationships with customers (Lu et al., 2015). In other words, a mobile app enables customers to directly communicate with the company. Browsing throughout the app may lead users to experience flow if mobile app is well-designed and effective in terms of task completion (Rushan & Huda, 2022). Besides, FE derived from the use of mobile app, transforms the users' attitudes towards the company from transactional into relational (Steinhoff et al., 2019). Previous research has shown that experiencing flow in web-based environments and mobile apps enriches customer engagement (Ali et al., 2022). Thus, the following hypothesis is proposed:

H3: Flow experience influences customer engagement.

3.4. Relationship between flow experience and customer citizenship behavior

FE is an important antecedent of consumer behavioural intention, in addition to its contribution to creating CE. In the online shopping context, FE is shown to have a significant influence on social shopping behaviours, such as sharing and recommending (Hsu et al., 2017). It has been also revealed that the recommendation and destination revisit intentions of tourists are significantly affected by FE (Zhang et al., 2021). In this study, it was assumed that FE is closely connected with CCB. CCB is a kind of non-purchase behaviour that describes extra efforts done by customers to develop a company's performance (Xie et al., 2017). Basically, CCB is an important customer behaviour form that covers positive word-of-mouth communications, feedback, and suggestions (Dang et al., 2020). However, in order to provide CCB, it is essential to psychologically form affective commitment of the customers, beforehand (van Tonder et al., 2018). Accordingly, FE and CCB are the behavioural constructs that are closely related to each other. Therefore, the fourth hypothesis is proposed as follows:

H4: Flow experience influences customer citizenship behavior.

3.5. Relationship between customer engagement and customer citizenship behavior

High quality of company–customer relationships may generate some extra-role behaviours like CCB, which is regarded as the voluntary and social efforts of the customers, favoured both by companies and other customers. If customers have positive feelings about a company’s services, they are willing to contribute voluntarily to increasing the benefits offered to other customers (Cheng et al., 2016). Some of the examples of CCB are assisting, sharing knowledge, and making recommendations to other customers about the company/brand. Maintaining CCB in the mobile app context is important for companies, since CCB and customer participation behaviour are shown to render innovative services (Moghadamzadeh et al., 2020). According to studies, CE positively impacts the quality of customer–company relationships, which later leads to CCB (Shafiee et al., 2020). Based on that, CE is considered as an organism leading to CCB and the following hypothesis is proposed:

H5: Customer engagement influences customer citizenship behavior.

4. Research model

Based on the proposed hypotheses, the research model is depicted in Figure 1. Previous studies indicated the influence of age, gender, and first-time/repeat use on mobile app-related decision-making behaviours (e.g. Nathan et al., 2020). Thus, to avoid these variables’ confounding effects on the dependent variable, they were employed as the control variables. This also contributes to control for individuals’ heterogeneity (Wooldridge, 2015). For this purpose, age was recodified as a dummy variable, taking the value 1 for those who are from generations X and Y, and the value 0 for those participants coming from generation Z. First-time/repeat app use was recodified as a dummy variable, taking value 1 if the app was used first time.

5. Methods

5.1. Research instruments

The measurement scales of the variables have been adapted from previous studies where the scales have been empirically validated. Based on DeLone and McLean’s (2003) conceptualization, MAQ was measured as a three-dimensional construct by 14 items borrowed from Hsu et al. (2012). CE via mobile apps was measured by 13 items derived from Ho and Chung (2020). FE was assessed by three items adapted from Ali (2016). Moreover, six items derived from Dang et al. (2020) were used to measure CCB. All construct items were measured by seven-point Likert-type scales ranging from strongly disagree (1) to strongly agree (7). In addition, seven questions were included in the survey form to measure the demographic and mobile app usage characteristics of the respondents. English scale items were translated into Turkish using a back-translation process to ensure the

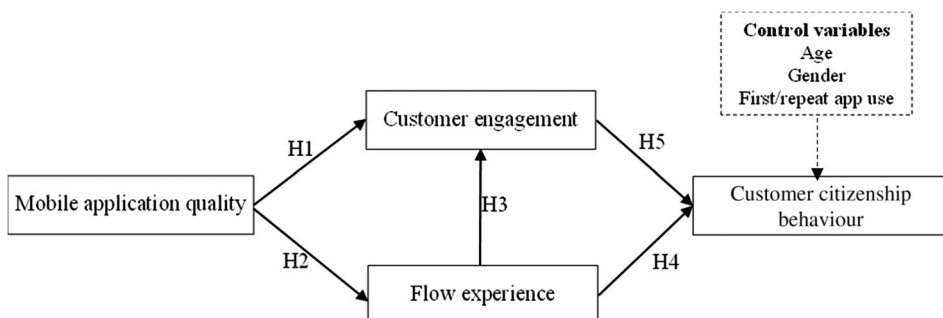


Figure 1. Research model.

accuracy of the translation. Then a pilot study was conducted with 16 tourism and marketing academicians to assess the clarity and readability of the survey instrument. Based on their feedback, a few wording adjustments were made to the questionnaire.

5.2. Data collection

A face-to-face survey was used to collect the data by following a convenience sampling method in the period of June–November 2022. Prospective participants were contacted in various public spaces so that people from different demographics could be reached. The respondents were screened to ensure that they have previously purchased any travel service (e.g. hotel booking) using a mobile app in the last 12 months. The survey team randomly approached a person, explained the purpose of the research, and invited them to fill out the survey. Although 323 surveys were collected, 315 data remained for the analyses after eliminating the incomplete forms.

Within the sample, %53.1 of the participants were male. In terms of age, %39 of the participants were between 21 and 30 years old, while %29.4 were between 31 and 40 years old. The majority of the participants (%60.2) held bachelor's degree, followed by high school (%19.1) and graduate degrees (%17.5). In terms of mobile travel app use characteristics, %18.4 of the participants declared to use Booking.com, which was followed by ETS (%17.8), Hotels.com (%7.6) and Odamax (%7.6). Majority of the participants (%70.2) used the mobile app for 3 years and more, while %15.1 used for 2 years. In addition, %62.2 of the participants reported that they use the mobile app up to three times in the last 12 months, while %37.8 have used more than four times.

5.3. Test of common method bias

Since a self-reported questionnaire was used in this study, common method bias was ensured before, during, and after the application of the questionnaire. Before the data collection, questionnaire scales were obtained from different sources and adapted to this study as suggested by Podsakoff et al. (2012). During the survey, only voluntary respondents participated in the study, and they were assured that their answers would be anonymous. When the data collection was completed, Harman's single factor test was conducted to statistically test any common method bias. The results revealed that 38.67% of the variance was explained by a single factor, which is below the critical ratio of 50%. Thus, common method bias was not a serious problem in this research.

6. Results

In this research, Partial least squares structural equation modelling (PLS-SEM) was preferred for the analyses so that the causal-predictive relations could be explored. PLS-SEM was conducted in two stages: (1) the assessment of the measurement model and (2) the analysis of the structural model. Besides, the predictive capability of the research model was evaluated by using holdout samples.

6.1. Measurement model

The low-order constructs (i.e. information, system, and service quality which are the dimensions of MAQ; CE; FE; and CCB) were defined as composite Mode A due to the presence of high correlations between the indicators of each construct (Rigdon, 2016). To evaluate composites estimated in Mode A, measures of internal consistency, reliability, and validity were applied (Table 1). Internal consistency is assessed by using composite's reliability (CR). All CRs were greater than 0.86, being all the constructs reliable. The composites' average variance extracted (AVE) was over 0.52. Therefore, all composites met the convergent validity criteria (Table 1). The discriminant validity was tested by

Table 1. Measurement model assessment.

Construct/Dimension/Indicator	Weight	Loading	CR	AVE
Information quality, Composite Mode A			0.887	0.664
The mobile app produces the most current information (Infq1)	0.289	0.798		
The mobile app provides me with all the information I need (Infq2)	0.326	0.838		
The information provided by the mobile app is accurate (Infq3)	0.269	0.776		
In general, the mobile app provides me with high-quality information (Infq4).	0.340	0.845		
System quality, Composite Mode A			0.864	0.615
The mobile app enables me to get on to it quick (Sysq1)	0.301	0.766		
The mobile app performs reliably (Sysq2)	0.315	0.746		
The mobile app can be adapted to me a variety of need (Sysq4)	0.341	0.818		
The mobile app makes it easy to get anywhere on the site (Sysq5)	0.317	0.804		
Service quality, Composite Mode A			0.859	0.605
The mobile app is prompt in responding to my queries (Servq1)	0.343	0.758		
I can speak with a representative at the mobile app in case I have problems with my account (Servq2)	0.324	0.814		
When I access my account, I feel secure, the mobile app instils confidence (Servq3)	0.322	0.797		
The mobile app delivers the service exactly as promised (Servq5)	0.297	0.738		
Customer engagement (CE), Composite Mode A			0.884	0.521
Using mobile app is fun (Ce1)	0.204	0.701		
Anything on mobile app related to travel grabs my attention (Ce2)	0.115	0.6.97		
Contents shown in mobile app seem interesting (Ce3)	0.111	0.670		
Mobile app enables information sharing with others (Ce4)	0.093	0.677		
Conversation or opinion through mobile app (Ce5)	0.163	0.703		
It is easy to deliver my opinion through mobile app (Ce6)	0.209	0.728		
I can usually get quick responses to any idea I post in mobile app (Ce7)	0.121	0.673		
Contents shown in mobile app is the newest information (Ce8)	0.137	0.701		
Using mobile app is very trendy (Ce9)	0.197	0.740		
Mobile app offers customized service (Ce10)	0.122	0.756		
Mobile app offers customized information search (Ce11)	0.211	0.739		
I would like to pass along information on brand, product, or services from mobile app to my friends (Ce12)	0.216	0.731		
I enjoy spending time on browsing mobile app contents (Ce13)	0.184	0.730		
Flow experience (FE), Composite Mode A			0.937	0.832
I felt totally captivated while browsing app (Fe1).	0.351	0.919		
Time seemed to pass very quickly while navigating app (Fe2)	0.377	0.938		
Nothing seemed to matter to me while browsing app (Fe3)	0.369	0.878		
Customer citizenship behaviour (CCB), Composite Mode A			0.879	0.594
I say positive things about to others (Ccb1)	0.308	0.770		
I give constructive suggestion to company on how to improve its app service (Ccb2)	0.273	0.785		
I recommend app to others (Ccb3)	0.306	0.792		
When I have a useful idea on how to improve app service, I communicate it to people of company (Ccbt4)	0.209	0.779		
When I experience a problem with app, I let them know so that they can improve service (Ccb5)	0.185	0.702		
I do things that can make app service process easier (Ccb6)	0.197	0.724		
Mobile app Quality (MAQ), Composite B			n.a.	n.a.
Information Quality	0.106	0.731		
Service Quality	0.581	0.948		
System Quality	0.408	0.911		

Notes: CR: Composite Reliability; AVE: Average Variance Extracted; All weights are significant at the 0.001 level; Ce2, Ce3, Ce4, Ce7, Ce8, Ce10, Ccb5 have been removed. n.a.: not applicable.

analyzing the heterotrait-monotrait ratio of correlations (HTMT) and the Fornell-Larcker Criterion (Hair et al., 2017). The square root of the AVE for each construct was higher than inter-construct correlations (Fornell-Larker criterion), and the HTMTs were below the cut-off value of 0.90 (Table 2). Thus, the variables included in the model met the discriminant validity.

The second-order construct, MAQ being composed of three dimensions (i.e. information quality, system quality, and service quality) were modelled and estimated as composites Mode B. To evaluate composite Mode B, the variance inflation factor (VIF) had to be considered. Since VIFs of information quality, service quality, and information quality were lower than 3, no critical collinearity issues existed for MAQ to be estimated as composite B.

Table 2. Results of multigroup analysis.

Relationships	Gender		Age		First time app use	
	Coefficient difference	<i>p</i> value MGA	Coefficient difference	<i>p</i> value MGA	Coefficient difference	<i>p</i> value MGA
CE-> CCB	-0.038	0.630	0.053	0.323	0.075	0.278
FE-> CCB	-0.072	0.739	0.074	0.188	-0.072	0.692
FE-> CE	-0.061	0.804	0.001	0.485	0.001	0.495
MAQ -> CE	0.014	0.430	-0.072	0.693	0.074	0.189
MAQ -> FE	0.201	0.240	0.075	0.282	0.053	0.331

Notes: CCB: Customer citizenship behaviour; CE: Customer engagement; FE: Flow experience; MAQ: Mobile application quality; MGA: Multigroup Analysis.

6.2. Structural model

The statistical significance of the main effects (baseline model) was assessed by employing a bootstrapping procedure with 10,000 subsamples to generate t-statistics and *p*-values (Hair et al., 2017). The overall fit of the estimated model was evaluated through several measures available for PLS-SEM (Henseler, 2021). First, the model provided a good fit according to the standardized root mean square residuals (SRMR) with a value of 0.074 less than the threshold of 0.08 and normalized fit index (NFI) with a value of 0.92 higher than the threshold of 0.9. Next, the unweighted least squares discrepancy (d_{ULS}), the geodesic discrepancy (d_G) and SRMR values should be smaller than 95% bootstrap quantile. The results showed that SRMR (value = 0.074, HI95 = 0.077), d_{ULS} (value = 0.831, HI95 = 0.887), and d_G (value = 0.437, HI95 = 0.426) values were below the 95% (HI95) of their corresponding values in the reference distribution. Hence, the overall goodness of the fit of the estimated model was acceptable. In addition, for the assessment of the model’s quality which is based on its ability to predict the dependent variables, coefficient of determination (R^2), cross-validated redundancy (Q^2), and effect size (f^2) values were used (Hair et al., 2017).

Since the Variance Inflation Factor (VIF) of the variables was lower than 1.621, there was no evidence of collinearity among the research variables. As represented in Table 3, the findings showed a positive direct effect of MAQ on both CE ($\beta = 0.568, p < 0.001$) and FE ($\beta = 0.364, p < 0.001$). The results, therefore, confirmed the H1 and H2. Moreover, findings reflected a positive effect from FE to CE, which supported the H3. Likewise, the effects of CE ($\beta = 0.472, p < 0.001$) and FE ($\beta = 0.236, p < 0.001$) on CCB were positive and significant. Consequently, based on these findings, support was obtained for the H5 and H4.

It is worth emphasizing the explanatory power of the MAQ on CE (of 68%), and the explanatory power of CE and FE on CCB (of 40%). Effect size values of 0.02, 0.15, and 0.35, respectively, represent small, medium, and large effects of an exogenous latent variable on an endogenous latent variable (Cohen, 1988). Thus, MAQ ($f^2 = 0.876$) and FE ($f^2 = 0.495$) have a high effect size on CE. Likewise, CE has a large size effect on CCB ($f^2 = 0.216$). A medium-size effect is observed from MAQ on FE ($f^2 = 0.152$). A low effect size appears for FE on CCB ($f^2 = 0.062$).

Table 3. Constructs’ discriminant validity.

	Fornell-Larcker criterion					Heterotrait-Monotrait ratio (HTMT)						
	CCB	CE	FE	Infq	Servq	Sysq	CCB	CE	FE	Infq	Servq	
CCB	0.770						CCB					
CE	0.584	0.722					CE	0.673				
FE	0.543	0.654	0.912				FE	0.606	0.757			
Infq	0.380	0.500	0.256	0.815			Infq	0.426	0.581	0.288		
Servq	0.441	0.643	0.341	0.603	0.778		Servq	0.523	0.779	0.398	0.741	
Sysq	0.404	0.613	0.338	0.672	0.743	0.784	Sysq	0.464	0.734	0.397	0.821	0.837

Notes: CCB: Customer citizenship behaviour; CE: Customer engagement; FE: Flow experience; Infq: Information quality; SERV: Service quality; Sysq: System quality. Fornell-Larcker criterion: Diagonal elements (bold) are the square root of the variance shared between the constructs and their measures (AVE). Off-diagonal elements are the correlations between constructs.

To test for differences between groups of participants according to the variables that might cause heterogeneity across individuals, Henseler's multigroup analysis (MGA) was conducted (Henseler et al., 2009). MGA results (Table 4) indicate that there are no significant differences in the relationships between research variables by gender, age, and first-time app use. These findings further confirm the validity of the structural model.

The Post hoc assessment of mediating effects: The mediating effects have been analyzed following Nitzl et al.'s (2016) analytical approach and tested by the bootstrapping procedure (with 10,000 subsamples). Results were reported in Table 3. First, the mediating effects of the CE ($\beta = 0.271, p < 0.001$) and FE ($\beta = 0.155, p < 0.001$) between MAQ and CCB were found significant. Second, the mediating effect of CE between FE and CCB was shown significant ($\beta = 0.201, p < 0.001$). Third, the mediating effect of MAQ through CE and FE, although smaller than the other effects, appeared to be significant.

In-Sample predictive power: A metric to assess the model's predictive quality is to use Stone-Geisser's Q^2 value (Geisser, 1974). From the blindfolding procedure, the Q^2 values were of 0.282 for CE, 0.106 for FE, and 0.212 for CCB. All larger than zero values indicated that the model achieved a substantial level of in-sample predictive power (Hair et al., 2017).

Out-Sample predictive model assessment: The predictive performance of a model refers to the ability of the model to predict accurately individual cases (Shmueli et al., 2019). PLSpredict routine, therefore, has been employed to assess the predictive performance of the research model. PLSpredict can be used either to assess both the prediction power of the model at the indicator level and the predictive power on the grounds of composite indicators. PLSpredict is a holdout sample-based procedure that generates case-level predictions on an item or a construct level to assess the benefits of predictive model assessment in PLS-SEM. If is positive indicates the prediction error of the PLS-SEM is small than the prediction error when the mean values of the indicators are used. With the aim of analyzing the prediction error at the indicator level, the prediction error in terms of the statistics root mean squared error (RMSE) and mean absolute error (MAE) has been compared between the PLS path model's input layer and the linear regression model (LM). As shown in

Table 4. Structural model estimates (effects on the endogenous variables).

	Coefficient	Direct effect		f^2	Supported
		t-value	Conf. interval		
Customer engagement (CE)					
$R^2 = 0.681; Q^2 = 0.282$					
H1 (+): MAQ \rightarrow CE	0.568***	19.792	0.501–0.714	0.876	Yes
H3 (+): FE \rightarrow CE	0.427**	11.942	0.369–0.482	0.495	Yes
Flow experience (FE)					
$R^2 = 0.132; Q^2 = 0.106$					
H2 (+): MAQ \rightarrow FE	0.364***	7.329	0.269–0.431	0.152	Yes
Customer citizenship behaviour (CCB)					
$R^2 = 0.407; Q^2 = 0.212$					
H5 (+): CE \rightarrow CCB	0.472***	6.913	0.294–0.487	0.216	Yes
H4 (+): FE \rightarrow CCB	0.236***	5.183	0.191–0.368	0.062	Yes
Control variables					
Gender	0.023	0.536			
Age	-0.074*	1.792			
First time/repeat	0.012	0.266			
			Indirect effect		
	Coefficient	t-value	Conf. Interval		
CCB					
MAQ \rightarrow CE \rightarrow CCB	0.271***	6.653	0.197–0.332		
MAQ \rightarrow FE \rightarrow CCB	0.155***	3.851	0.063–0.145		
FE \rightarrow CE \rightarrow CCB	0.201***	7.040	0.147–0.256		
MAQ \rightarrow FE \rightarrow CE \rightarrow CCB	0.073***	5.264	0.049–0.102		

Notes: *** $p < 0.001$, ** $p < 0.05$, * $p < 0.10$. Bootstrapping based on $n = 10,000$ subsamples. A one-tailed test for a t-Student distribution is applied for direct and mediation effects. A two-tailed test for a t-Student distribution is applied for moderating effects. CI- bias corrected 95% confidence interval based on 10,000 bootstrap subsamples.

Table 5, $Q^2_{predict}$ values were positive at the indicator level and composite score level. Furthermore, when focusing on the manifest variables, the prediction error statistics (RMSE and MAE) were lower when using a PLS-SEM than when applying a LM model. Thus, the model showed a predictive power to predict new cases for the variable CCB. This implied additional support for the research model that was proposed in the study.

7. Discussion and conclusion

Grounded on the SOR theory, the conceptual model and its test results in this research enabled to diagnosis of the direct and intermediary relationships among the variables that determine behaviours of the mobile travel app's users. One of the noteworthy findings of the study is the confirmation of the three-dimensional structure of MAQ. Following DeLeone and McLean's (2003) information system success model, a mobile app's quality is shown to be measured by its system, information, and service quality-based effectiveness. This finding is in the line with other studies that adapted DeLone and McLean's perspective in measuring mobile tourism apps quality and showing its impact on user behaviours (e.g. Hew et al., 2016).

Consistent with prior studies (Ali et al., 2022), the findings also disclosed that MAQ has an important determinant of FE and CE. However, contrary to Ali et al. (2022), who found an insignificant relationship between FE and hotel mobile app users' engagement, the present results showed that FE is an important determinant of CE. As the current study reveals, the formation of CE by both MAQ and FE is coherent with the view that assumes satisfaction and positive emotion as the pre-requisites of CE (Pansari & Kumar, 2017). While MAQ leads to customer satisfaction, experiencing flow reflects the positive emotional status. To the authors' best knowledge, this study has become the first in exploring the positive impact of CE and FE on CCB in the mobile app context. Besides, the results ultimately indicated that CE and FE play a mediator role in the MAQ-CCB relationship, while CE additionally mediates the FE-CCB interaction.

To sum, the results provided empirical support for the direct effect of MAQ on CE and FE, as well as its indirect influence on CCB. In other words, if customers perceive that mobile travel apps perform

Table 5. Construct prediction assessment.

	PLS-SEM			LM			PLS-LM	
	RMSE	MAE	$Q^2_{predict}$	RMSE	MAE	$Q^2_{predict}$	RMSE	MAE
Ccb3	1.560	1.210	0.208	1.564	1.216	0.211	-4	-6
Ccb4	1.941	1.637	0.032	1.949	1.660	0.024	-8	-23
Ccb1	1.404	1.171	0.167	1.458	1.135	0.185	-54	36
Ccb6	1.896	1.550	0.052	1.888	1.566	0.060	8	-16
Ccb5	1.689	1.391	0.066	1.706	1.390	0.047	-17	1
Ccb2	1.862	1.562	0.063	1.866	1.580	0.060	-4	-18
Ce6	1.515	1.199	0.316	1.516	1.206	0.318	-1	-7
Ce7	1.451	1.180	0.223	1.472	1.194	0.201	-21	-14
Ce10	1.425	1.139	0.205	1.440	1.150	0.189	-15	-11
Ce5	1.808	1.506	0.101	1.811	1.508	0.130	-3	-2
Ce11	1.344	1.057	0.300	1.363	1.070	0.280	-19	-13
Ce13	1.739	1.474	0.151	1.825	1.510	0.160	-86	-36
Ce3	1.469	1.192	0.152	1.513	1.226	0.100	-44	-34
Ce8	1.110	0.899	0.362	1.130	0.869	0.403	-20	0
Ce12	1.537	1.221	0.217	1.575	1.260	0.178	-38	-39
Ce1	1.389	1.092	0.287	1.399	1.091	0.277	-10	1
Ce9	1.301	1.001	0.193	1.314	1.011	0.199	-13	-10
Ce2	1.473	1.190	0.186	1.491	1.201	0.165	-18	-11
Ce4	1.644	1.308	0.093	1.646	1.333	0.095	-2	-25
Fe3	1.940	1.637	0.067	1.947	1.635	0.060	-7	2
Fe2	1.806	1.600	0.124	1.886	1.614	0.142	-80	-14
Fe1	1.924	1.634	0.101	1.935	1.654	0.126	-11	-20

Notes: $Q^2_{predict}$ values are 0.511, 0.117, and 0.192 for Customer engagement, Flow experience, and Customer citizenship behaviour.

well in terms of system, information, and service quality features, they will possibly experience flow when using the app and their engagement toward the app will increase. As a result, customers will show CCB tendencies, such as constantly sharing their feedback with the company to help improve the quality of the app.

7.1. Theoretical implications

This study has several theoretical contributions to the extant literature. Firstly, this research is one of the early attempts in investigating the role of CE regarding mobile travel app usage behaviour. To date, only a few studies (e.g. Ali et al., 2022) included CE to their research model to clarify mobile app users' behaviour. Thus, by examining the antecedents and outcomes of CE in the travel mobile app context, the results reinforced the previous literature. By doing so, this study responded to calls for further research on the role CE in the mobile app use (e.g. Fang et al., 2017; Hollebeek et al., 2022).

Secondly, the study results enhanced the CE literature by identifying MAQ and FE as the antecedents of CE. Although, satisfaction and emotion are previously offered as the two tenets of CE (Pansari & Kumar, 2017), for the authors' best knowledge, this is the first study that confirms this view by using MAQ as the reflection of user satisfaction and FE as the indicator of positive emotion. That enabled to gain an in-depth understanding regarding the nature of CE.

Thirdly, while early studies predominantly investigated behavioural intention as the outcome of CE, by uniquely focusing on CCB instead of behavioural intention, the present study extended the mobile app body of knowledge. In spite of the importance of CCB as being a type of customer value co-creation behaviours (Jung & Yoo, 2017), previous studies mostly neglected its role, especially in the mobile app context. Moreover, although customer satisfaction, loyalty, and trust are considered as the main antecedents of the CCB in the literature, scholars (e.g. Mitrega et al., 2022) noted the need for more research that considers to previously neglected constructs as the potential antecedents of CCB. Thus, the present study contributed to the related literature from this aspect by introducing CE and FE constructs as the antecedents of CCB in mobile app context.

Lastly drawing on SOR theory, this study offered an integrated research model to understand mobile application users' behaviour. Specifically, the analysis results confirmed that MAQ is a stimulus which triggers organisms of FE and CE, leading to CCB as a response. Moreover, empirical results affirmed the mediating role of FE and CE between MAQ and CCB. To date, there is a dearth of research regarding the antecedents of mobile app users' citizenship behaviour. Thus, the current research extends the literature by identifying the determinants of CCB and by clarifying the behavioural mechanism of the mobile travel app users.

7.2. Managerial implications

Since mobile apps have become an indispensable marketing medium for the companies, managers need to have in-depth knowledge related to the app users' behaviours for making rational decisions. Thus, the results of this study provide several implications for company managers.

CE has become imperative for business financial success, since it is assumed as a better predictor of marketing outcomes (i.e. loyalty) than traditional constructs like customer satisfaction. The current study's results revealed that MAQ has the utmost importance in the formation of mobile travel app users' engagement because it has a direct impact on CE as well as an indirect effect via FE. Thus, improvement of the mobile apps' quality is crucial to match users' expectations and satisfy them. Considering multi-dimensional (i.e. information, system, and service quality) and the integrated nature of mobile app quality, system designers and managers need to collaboratively develop content and design-based strategies. In this process, getting feedback from the app users is necessary. Including an easily accessible feedback tool in the app may encourage customers to share their opinions.

Since the study findings reflected MAQ as the determinant of FE, functionality and the creation of positive user experiences should be considered equally important in the development and management of mobile apps. FE mostly occurs when there is a balance between user skills and the challenges of using app (Zhou, 2013). Thus, companies should design mobile apps having user-friendly features that provide FE to their users. Moreover, companies should consider improving the app characteristics in a way that arouses hedonic emotions. In this way, app users may concentrate on the usage which will trigger FE.

The study results also revealed that CE and FE contribute to developing CCB. Thus, the higher CE with mobile travel apps and the more experience of flow, the greater possibility to develop CCB. Since one of the behavioural outcomes of CCB is helping to improve the services, CCB may also contribute to the improvement of mobile apps. With customers' feedback, the quality of the mobile app can be increased by taking into consideration its users' perspective.

Both CCB and CE are categorized as extra-role behaviours, and therefore, they require the voluntary contribution of the customers which is challenging to maintain for companies in today's though competitive trade environment. Thus, it seems rational to recommend company authorities and mobile app developers consider CE and CCB among the mobile app quality indicators.

7.3. Study limitations and future study recommendations

It is important to evaluate this study in light of its limitations that open doors for future research. While the first limitation is the use of a convenience sampling method, the second lies in the socio-demographic characteristics of the participants, who were highly educated (%60.2, bachelor's degree) and experienced mobile app users (%70.2, user of an app for 3 years and above). In future studies, it would be interesting to examine how socio-demographics moderate hypothesized relationships. Third, in addition to the variables used in this research, other exogenous factors may affect CCB. These might have impacted the current research's findings, and therefore, the results should be carefully generalized. Lastly, to clarify the robustness of the proposed conceptual framework, researchers are advised to test it in different cultures and research contexts like virtual and augmented reality apps.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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