The influence of mobile application design features on users' stickiness intentions as mediated by emotional response

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Abstract

Purpose – The purpose of this paper is to determine the influence of mobile design features on consumers' mobile app stickiness intentions, as mediated by users' emotional response (pleasure, arousal and dominance).
Design/methodology/approach – Using the stimulus–organism–response model, this study employed conditional process modelling to investigate the influence of three categories of mobile design features on users' stickiness intentions. The emotional responses of pleasure–arousal–dominance were investigated for their mediating effect. The participants included women aged 18–36.
Findings – Design features provided consumer-led interactions' influence on emotional responses of pleasure, arousal and dominance. Mobile design features were not a significant predictor of stickiness intentions. Arousal was a significant mediator of mobile design features on stickiness intentions, whereas dominance had no mediating effects.
Originality/value – This paper extends the growing research on mobile applications by investigating design features using Magrath and McCormick's (2013) mobile marketing design framework. This paper also adds to the body of knowledge on stickiness within a mobile context.

Keywords Mobile design features, Mobile atmosphere, Retail, Emotions, Stickiness
Paper type Research paper

Introduction

With the growing mobile environment, it is important to establish the design features that contribute to the mobile application (app) atmosphere. Kotler (1973, p. 50) defined atmospherics as "the conscious designing of space to create certain buyer effects. More specifically, atmospherics is the effort to design buying environments to produce specific emotional effects in the buyer that enhance his purchase probability". Atmospherics can account for two-thirds of purchases (Hausman and Siekpe, 2009), determine a retailer's effectiveness (Savelli *et al.*, 2017) and serve as a major differentiating factor among retailers. The influence of online store atmospherics is well established in literature (Hsieh *et al.*, 2014; Mazaheri *et al.*, 2014; Reydet and Carsana, 2017). Key findings show online atmospherics affects attitude (Richard and Habbi, 2016), flow (Gao and Bai, 2014), satisfaction, (Eroglu *et al.*, 2003), impulse buying behaviour (Barros *et al.*, 2019) and purchase intention (Liu *et al.*, 2008; Wu *et al.*, 2014). The retailer's app enables one to control the "in-store" experience through a variety of features to achieve their objectives (Zhao and Balagué, 2015). This allows retailers to create support for each stage of the consumer decision process from need recognition through purchase to post-behaviour (Wright, 2012). Given the competitive nature of retail, the proper mix of mobile design features differentiates the retailer from its competitors, giving it the edge to be successful.

Magrath and McCormick (2013) proposed a mobile marketing design framework consisting of 18 design elements grouped into four categories: (1) multimedia product viewing

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(MMV), (2) informative content, (3) product promotion features (PPFs) and (4) consumer-led interactions (CLIs). Many of the design elements were based on studies of online environments due to the infancy of mobile literature. Design elements that are used for online site design cannot be directly translated to a mobile app (Lee and Kim, 2019). Mobile atmospherics is generated through the proper mix of mobile design features to elicit a stimulating environment; therefore, research into mobile app features is needed to understand which elements will impact users' behaviour and how.

Much of the early research on mobiles has centred on the technology acceptance model. However, few studies in a mobile context have examined Mehrabian and Russell's (1974) stimulus–organism–response (SOR) paradigm, which categorized emotional responses into three states: pleasure, arousal and dominance (PAD). Numerous studies have investigated arousal and pleasure, as they relate to the layout and features of sites (Wu *et al.*, 2014; Barros *et al.*, 2019); however, these studies did not investigate dominance. Hsieh *et al.* and Mazaheri *et al.* (2014) suggested the relevance of investigating dominance in any technology-based environments. Wolfinbarger and Gilly (2011) indicated that such environments thrive on the user's perceived control and freedom.

Retailers are continuously challenged on how to best capture user attention and how to increase consumer stickiness, the likelihood to continue usage (Kim *et al.*, 2016). While, much of the research on mobile apps has focused on adoption intentions (Ahuja and Khazanchi, 2016) and shopper types (Yang and Kim, 2012) rather than post-adoption behaviour such as stickiness (Kim *et al.*, 2016). The need to understand stickiness is greater now than ever, as app competition is increasing (Johnston, 2021); however, any app consumers download to their limited space must have a differentiating element for consumer to view as worthwhile.

Currently, fashion retailers and brands are scrambling to develop a channel of sales digitally through ecommerce site and mobile apps (Johnston, 2021). Industry needs guidance on best mobile app designs to capture consumer market share in an ever-changing retail environment. To fill the research gap in mobile app atmospheric research, the purpose of this study was to determine the influence of mobile application design features on stickiness intentions as mediated by emotional response (PAD) using the SOR framework of experimental design. Theoretically, this study adds to the body of knowledge of the SOR framework by applying it to a mobile context. In addition, the study builds on Magrath and McCormick's (2013) mobile-marketing design framework by integrating Eroglu *et al.* (2003) high and low task-relevant cues as design features. Previous research in atmospherics has focused on high task-relevant cues (informative product details or navigation aids), minimizing the potential impact low task-relevant cues have on consumers' behaviour. Finally, mobile app research is still a new frontier for many fashion retailers, and the results from this research offer recommendations for developing fashion brand apps.

Theoretical framework

Consumers engage in the decision-making process within the store environment (Mohan *et al.*, 2013; Barros *et al.*, 2019). Mehrabian and Russell's (1974) SOR framework articulated that environmental elements within the store act as stimuli determining consumers behavioural intention through emotional response. In the retail context, the stimulus (*S*) is the atmosphere that will influence a consumer's cognitive and/or affective state (*O*), which in turn determines the consumer's behavioural response (*R*) (Mehrabian and Russell, 1974; Zhang *et al.*, 2015).

Stimulus. Atmospherics focuses on the conscious designing of environments to illicit specific behavioural responses (Kotler, 1973) and is often characterized as a multidimensional construct (Erogulu *et al.*, 2003; Loureiro and Roshck, 2014) related to consumer experience (Savelli *et al.*, 2017). As illustrated in Turley and Milliman's (2000) work on atmospheric

effects, numerous scholars have proposed varying taxonomies to classify atmospheric stimuli. Web environmental stimuli have been classified as virtual layout and design, virtual atmospherics, virtual theatrics and virtual social presence (Manganari*et al.*, 2009), and as functional attributes, informative attributes and communicative features (Gatautis and Vaiciukynaite, 2013).

To simplify the dimensions of atmospherics, Eroglu *et al.* (2000) dichotomy of atmospherics proposed online atmosphere can be categorized into high and low task-relevant cues to act as stimuli. High task-relevant cues are the verbal or pictorial site descriptors that guide the shopping goal attainment, such as price, return policies, descriptions of merchandise. Low task-relevant cues are the site components which are not needed for the completion of the task or purchase, such as animation, sounds, pictures, and entertainment. High task-relevant cues are more task-driven in comparison to low task-relevant cues, which are thought to be opportunities to increase experiential value of online shopping. Following the taxonomy developed by Eroglu *et al.* (2000), the current study considers mobile design features as high and low task-relevant cues to enhance user's stickiness intentions. Although prior research has examined the elements constituting brick-and-mortar and Web atmospherics, there is little to no empirical examination on mobile app atmospherics (Lee and Kim, 2019).

Stimuli-mobile design features. Vrechopoulos *et al.* (2010, p. 350) describe mobile app atmospherics as "the conscious designing of mobile app environments to create positive effects on users in order to increase favourable users' response". Atmospherics in a mobile context includes mobile design features. Magrath and McCormick (2013) proposed the mobile marketing design framework to capture the design elements of fashion retail mobile apps. They proposed 18 individual design elements grouped into the four stimulus categories described below.

MMV is defined as the consumers' ability to see product selections of the retailer's store via multimedia features such as videos, graphics and/or image interactivity, which create an interactive and sensory environment (Gulliver and Ghinea, 2010; Sina and Wu, 2019). MMV's design elements can be viewed as both high and low task-relevant cues since there is a delicate level of multimedia features that consumer deems necessary for task completion; however, anything over that threshold can be viewed as somewhat unimportant to the completion of the task.

Informative content is defined as the readable text, with the goal of informing the consumer (Grandon and Ranganathan, 2001; McCormick and Livett, 2012) about the product or service at hand. Informative content includes product, service and company information. Informative content design element are high task-relevant cues and serve as the basic elements necessary for a product page.

PPF encompasses promotion of the retailer's product to increase purchase intention and sales (Tong *et al.*, 2012). While PFF can contain visual and textual information, the focus is promotion and persuasion (Park and Lennon, 2009), consisting of the design elements of coupons, incentives, rewards, discounts, etc. (Magrathand McCormick, 2013). The elements composing PPF have aspects of both high and low task-relevant cues as they could persuade a consumer in their shopping goal attainment, however, as they are not necessary for completion of task or purchase.

CLI aids the consumers' experience and service. Led by the consumer, these interactions do not intentionally promote the product but focus on giving consumers control over their experience, creating personalized shopping experiences such as user-generated product reviews and augmented and virtual reality (Ranganathan and Ganapathy, 2002; Poncin and Mimoun, 2014). These design elements are low task-relevant cues as they add to the experience but are not necessary for the purchase of a product.

Organism: pleasure, arousal, dominance. Jung Chang *et al.*(2014) defined organism as the internal processes that intervene between external stimulus and consumer behaviour. To create successful shopping environments, it is vital to understand consumers' emotion as they determine behaviour. Emotions are often expressed through the construct of PAD, which is commonly used as a mediator between stimuli and organism (Wu *et al.*, 2014; Das and Varshenya, 2017). Many studies have noted the importance of atmospherics on consumers' emotional response within a retail space (Rayburn and Voss, 2013; Wu *et al.*, 2014).

Mehrabian and Russell (1974) categorized emotional responses into three states: pleasure, arousal and dominance. Pleasure includes feelings ranging from depression to ecstasy. Arousal is an active response ranging from feelings of calm to high alert. Dominance is the extent to which individuals feel control over or controlled by the environment. Online environmental cues significantly affect emotional responses (Eroglu *et al.*, 2001). Web atmospherics is needed to create pleasant digital experience to improve consumers expectations of other channels within a brand (Loupiac and Goudey, 2020). Higher level of arousal and pleasure may be achieved through good layout, design and pleasing atmosphere (Wu *et al.*, 2014).

Response. Completing the SOR framework, response is the outcome of the internal processes of the organism, often categorized as approach/avoidance behaviour (Mehrabianand Russell, 1974; Fiore and Kim, 2007). Approach behaviour is all positive outcomes that might be related to shopping in a mobile app, such as increasing frequency or length of visits (Roux *et al.*, 2020). Stickiness has been operationalized as the length of a consumer's visit (Lin *et al.*, 2010), the ability for the site to attract and retain consumers (Xuand Liu, 2010; Reichheld and Schefter, 2000; Benlian, 2015) and the number of repeated visits and usage (Li *et al.*, 2006). This study adopts Racherla *et al.* (2012, p. 28) definition of mobile app stickiness (MAS) as "the time users spend interacting with an app and how often consumers use the app to accomplish specific tasks".

Consumers' perception of the atmosphere influences time spent (Donovan and Rossiter, 1982; Eroglu *et al.*,2001) and revisit intentions (Das and Varsheneya, 2017). Consistent results were found in the Web context (Roy *et al.*,2014; Aboubaker Ettis, 2017; Sina and Wu, 2019) and in the mobile context (Lee and Kim, 2019). Hoffman and Novak (1996) concluded that if a consumer likes a site, their intention to stick is higher. Stickiness has often been considered an antecedent to loyalty, directly impacting a retailer's bottom line (Kim *et al.*, 2016), thus leading businesses to put emphasis on effective site design to increase positive return behaviour by improving stickiness (Lin *et al.*, 2010).

In the online atmospherics' context, design features have shown to be positively impactful on retail sales (Hausman and Siekpe, 2009; Reydet and Carsana, 2017). Mobile app shoppers spend twice as much money than other customers, and conversation rates from mobile apps are three times higher than mobile sites (Narang and Shankar, 2019). However, understanding the specific mobile design features that effect stickiness through emotions have not been investigated. Mobile atmospherics research has been limited to exploring the effects of high tasks cues, such as user experiences (Lee and Kim, 2019), and have overlooked the potentially important effect of low tasks cues as a driver in digital sales. Given the retail environment as highly competitive in nature (Hagberg *et al.*, 2016) and the increase of digital platform sales (Wu *et al.*, 2014; Loupiac and Goudey, 2020), the effective use of mobile design features may give retailers an advantage. Therefore, based on the SOR framework and the parameters described above, our study hypothesized:

H1. MMV features will influence MAS as mediated by (a) pleasure, (b) arousal and (c) dominance.

H2. PPF will influence MAS as mediated by (a) pleasure, (b) arousal and (c) dominance.

H3. CLI features will influence MAS as mediated by (a) pleasure, (b) arousal and (c) dominance.

Methodology

Mobile app stimuli

Six stimuli, two per mobile design feature, were developed using a fictional mobile shopping app as the basis. All stimuli included high task-relevant cues (informative content features) and were distinguished based on the low task-relevant cues for each design feature, MMV, CLI, PPF, being present or not present. Table 1 shows the operationalization of mobile design features for stimuli creation. Stimuli were developed using numerous screenshots of retail mobiles apps and were composited using Photoshop, allowing realistic creation of mobile screens. Stimuli were created and presented in the dimension of one of the largest screen sizes at 5.5 inches. Each set of stimuli was composed of two screenshots displayed vertically for participants, as shown in Figure 1.

Instrument development

After viewing each stimulus, participants were presented questions relating to emotion and MAS. The next section, organism, consisted of questions pertaining to their emotional response. PAD measured emotion with six items each on a seven-point semantic differential scale adapted from Mehrabian and Russell (1974). The third section, response, contained items measuring MAS. MAS was measured with four items adapted from Benlian (2015) on a seven-point Likert scale from strongly agree to strongly disagree. Measurement items and reliability coefficients for all constructs can be seen in Table 2. The survey concluded with demographic questions, including operating system, race/ethnicity, education, income and age, to further understand the makeup of the sample.

Data collection

Amazon Mechanical Turk (MTurk) was used to recruit women, age 18–36. Generation Y (individuals born between 1980 and 2000) are among the first generation to grow up with technology and are more likely to be up to date and comfortable with technology. Their usage of smartphones outranks any other generation (Nielsen, 2014). Staff (2014) found females

Mobile design features	Stimulus product*	Design elements present	Operationalized
MMV	Bathing suit	Video	Video play button
	Jeans	Image/graphics	Multiple product ellipses, opaque next product view
PPF	High heels	Coupons	Discount code
	Sandals	Incentives	"Hurry! Almost out of stock", free shipping
		Rewards	Sign in to earn points, "online exclusive"
		Discounts	Price reduction as shown with original price mark through
		Social media promotion	Social media share icon
CLI	Summer dress	Personalization	User-generated product reviews
	Formal dress	Customization	Suggested items based on behaviour

Note(s): *All stimulus products utilized the same design elements and were operationalized in the same manner

Table 1. Stimuli operationalization

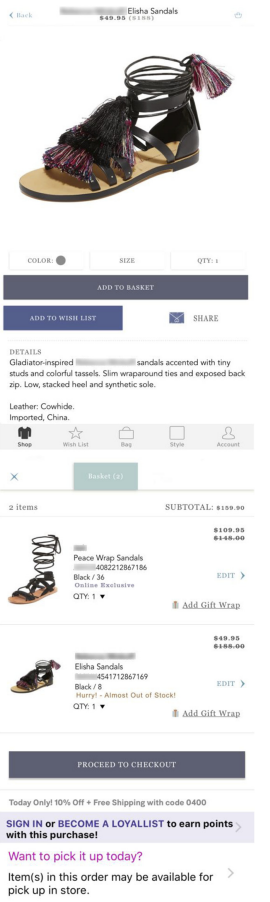

Figure 1.
PPF features stimuli

were more likely than males to purchase clothing and accessories online. A total of 304 participants were recruited; however, nine cases were not completed, resulting in 903 useable cases out of a possible 912 cases (participants × three mobile design features). The demographic characteristics of the sample are presented in Table 3.

Results

Conditional process modelling

To test the study's conceptual model containing multiple mediators, conditional process analysis with bootstrapped confidence intervals was used (Hayes and Preacher, 2014). Hayes and Preacher (2014) process modelling allowed x to be multi-categorical by relying "on the fact that mean differences can be estimated with a linear model by representing groups with a set of k-1 variables, where k is the number of groups" (p. 455). This allows a mathematical model identical to ANOVA but also allows the reproduction of k groups means on the mediator and the dependent variable. The model, parameter estimates and model fit statistics keep the information about how the groups differ from one another, made possible through the coding of the multi-categorical variable. Dummy coding was used to indicate the type of

Constructs	Source	Measurement items	Reliability
Pleasure	Mehrabian and Rusell (1974)	Y1 – After viewing this app, I felt: Unhappy/Happy	Cronbach $\alpha = 0.947$
		Y2 – After viewing this app, I felt: Annoyed/Pleased	
		Y3 – After viewing this app, I felt: Unsatisfied/Satisfied	
		Y4 – After viewing this app, I felt: Despairing/Hopeful	
		Y5 – After viewing this app, I felt: Melancholic/ Contented	
		Y6 – After viewing this app, I felt: Bored/Relax	
Arousal	Mehrabian and Rusell (1974)	Y7 – After viewing this app, I felt: Relaxed/Stimulated	Cronbach $\alpha = 0.858$
		Y8 – After viewing this app, I felt: Calm/Excited	
		Y9 – After viewing this app, I felt: Unaroused/Aroused	
		Y10 – After viewing this app, I felt: Sleepy/Wide awake	
		Y11 – After viewing this app, I felt: Sluggish/Frenzied	
		Y12 – After viewing this app, I felt: Dull/Jittery	
Dominance	Mehrabian and Rusell (1974)	Y13 – After viewing this app, I felt: Controlled/ Controlling	Cronbach $\alpha = 0.795$
		Y14 – After viewing this app, I felt: Influenced/ Influential	
		Y15 – After viewing this app, I felt: Cared-for/In control	
		Y16 – After viewing this app, I felt: Awed/Important	
		Y17 – After viewing this app, I felt: Submissive/ Dominant	
		Y18 – After viewing this app, I felt: Guided/ Autonomous	
MAS	Benlian (2015)	After viewing this one fashion product, ____	
		Y19 – It would be highly likely that I would return to this app to shop again for fashion products	Cronbach $\alpha = 0.969$
		Y20 – I would continue to shop for other fashion products on this app	
		Y21 – I intend to spend more time shopping for fashion products on this app	
		Y22 – I would visit this app again the next time I shop for fashion products	

Table 2. Survey constructs, item sources and Cronbach alphas

mobile design feature viewed, (1) MMV, (2) PPF, (3) CLIs. K-1 groups were created with D_i set to 1 if a case is in the selected group, and 0 otherwise. One group received no coding; thus, all k-1 dummy variables are set to 0. This group becomes the reference group in analysis; hence, parameters are quantified relative to their reference group. Model 4 was identified as appropriate, as it was the only available model at the time that allowed for multi-categorical independent variables (Hayes and Preacher, 2014). However, due to the study design, no true control group was created in efforts of keeping stimuli as realistic as possible; therefore, the analysis was run three times, alternating reference groups.

To determine if PAD indeed acted as a mediator between mobile design features and MAS, asymmetric bootstrap confidence interval was examined. The relative indirect effect is determined to be statistically different from zero if the bootstrapped confidence interval does not contain zero (Hayes and Preacher, 2014).

Multimedia product viewing features

MMV was not a significant predictor of pleasure when PPF nor CLI was held as the reference group; however, it did influence MAS (unstandardized $\beta = 0.15$, $p < 0.001$, relative to PPF;

Variable	Levels	Frequency	%
Gender	Female	304	100
	Male	0	0
Operating system	Apple	134	44.1
	Android	163	53.6
	No response	7	2.3
Race/ethnicity	White/Caucasian	223	73.4
	Black/African American	27	8.9
	American Indian or Alaska Native	1	0.3
	Asian	18	5.9
	Native Hawaiian or Pacific Islander	1	0.3
	Hispanic	14	4.6
	Multi-racial	12	3.9
	Other	1	0.3
	No response	7	2.3
Education	Less than high school	2	0.7
	High school graduate	26	8.6
	Some college/currently enrolled	89	29.3
	2-year degree	33	10.9
	4-year degree	97	31.9
	Professional degree	43	14.1
	Doctorate	6	2
	No response	8	2.6
Income	Less than IS$10,000–US$29,999	106	34.9
	US$30,000–US$59,999	101	33.2
	US$60,000–US$89,999	53	17.5
	US$90,000–more than US$150,00	37	12.2
	No response	7	2.3
Age	19–23	46	15.1
	24–29	113	37.1
	30–36	127	41.8
	No response	18	5.9

Note(s): Number of participants (n) = 304

Table 3. Demographic characteristics

unstandardized $\beta = 0.135$, $p < 0.001$, relative to CLI). In addition, MMV relative to PPF or CLI did not indirectly influence MAS intention through pleasure, thus rejecting *H1a*. While MMV was not a significant predictor of arousal relative to PPF, it did influence arousal (unstandardized $\beta = -0.034$, $p < 0.001$) relative to CLI. Furthermore, MMV relative to PPF did not indirectly influence MAS intention through arousal, but MMV relative to CLI did indirectly through arousal influence MAS intentions (95% CI = −0.094 to −0.011), thus, partially supporting *H1b*. MMV was not a significant predictor of dominance relative to PPF and CLI. Although it did not indirectly mediate the relationship between MMV and MAS relative to CLI, dominance mediated the effect of MMV on MAS (95% CI = −0.008 to −0.012), relative to PPF, thus, partially supporting *H1c*.

Product promotion features

While PPF was not a significant predictor of pleasure relative to MMV, it did influence pleasure (unstandardized $\beta = -0.248$, $p < 0.05$) relative to CLI. Additionally, PPF did influence MAS (unstandardized $\beta = -0.15$, $p < 0.001$, relative to MMV; unstandardized $\beta = -0.015$, $p < 0.001$, relative to CLI). Furthermore, PPF relative to MMV did not indirectly influence MAS intention through pleasure, but PPF relative to CLI did indirectly through pleasure influence MAS intentions (95% CI = −0.358 to −0.013), thus, partially supporting *H2a*. PPF was not a significant predictor of arousal relative to MMV; however, it did influence

arousal (unstandardized $\beta = -0.248$, $p < 0.01$) relative to CLI. Additionally, PPF relative to MMV did not indirectly influence MAS intention through arousal, but PPF relative to CLI did indirectly through pleasure influence MAS intentions (95%CI = −0.075 to −0.004), thus, partially supporting *H2b*. PPF was not a significant predictor of dominance when MMV was held as the reference group; however, PPF relative to CLI was a significant predictor of dominance (unstandardized $\beta = -0.155$, $p < 0.05$). Furthermore, PPF relative to MMV or CLI did not indirectly influence MAS intention through dominance, thus rejecting *H2c*.

Consumer-led interaction features

While CLI was not a significant predictor of pleasure relative to MMV, it did influence pleasure (unstandardized $\beta = 0.248$, $p < 0.05$) relative to PPF. Moreover, CLI did influence MAS (unstandardized $\beta = -0.135$, $p < 0.001$, relative to MMV; unstandardized $\beta = 0.015$, $p < 0.001$, relative to PPF). Furthermore, CLI relative to MMV did not indirectly influence MAS intention through pleasure, but CLI relative to PPF did indirectly through pleasure influence MAS intentions (95% CI = 0.007–0.363), thus, partially supporting *H3a*. CLI is a significant predictor of arousal (unstandardized $\beta = 0.344$, $p < 0.001$, relative to MMV; unstandardized $\beta = 0.247$, $p < 0.01$, relative to PPF). In addition, CLI relative to MMV indirectly influenced MAS intention through arousal (95% CI = 0.012–0.093) and indirectly relative to PPF (95% CI = 0.004–0.075), therefore supporting *H3b*. While CLI was a significant predictor of dominance (unstandardized $\beta = 0.179$, $p < 0.05$, relative to MMV; unstandardized $\beta = 0.155$, $p < 0.05$, relative to PPF), CLI, relative to MMV and PPF, did not indirectly influence MAS intentions through dominance, thus rejecting *H3c*.

Summary of direct effects and hypotheses testing

Figure 2 shows the conceptual model of mobile design feature with corresponding path coefficient and significance relative to the corresponding reference group. Table 4 shows the indirect effect results.

Discussion, limitations and future research

This study examined mobile design features effects on stickiness, mediated through PAD. The study's findings have several contributions and implications for industry, theory and consumers, and like with any research, there were limitations that lead to further investigation.

Industry

First, the findings provide actionable suggestions for retailers and brands targeting specific design features to incentivize stickiness behaviour such as incorporating interactivity into the app. Specifically, for MMV, the results show consumers who viewed MMV express feelings of arousal relative to consumers who viewed CLI, and arousal did mediate the relationship between MMV and MAS. Mobile apps should not only have still images, but include videos and other interactivity technology for consumers to view products and arouse more time on an app.

By contrast, neither pleasure nor dominance was a significant mediator between MMV and MAS, possibly due to the lack of interactivity in the stimuli. Feelings of dominance are rooted in the ability to have control over the environment, and interactivity in the study's stimuli was a limitation. Future studies could give respondents browsing control and capture screen time of how respondents view images, videos or abandon a webpage. Additionally, pleasure was a not a significant mediator, potentially due to the choice of the products used in the stimuli. The construct of pleasure consists of feelings of strong affection. Therefore,

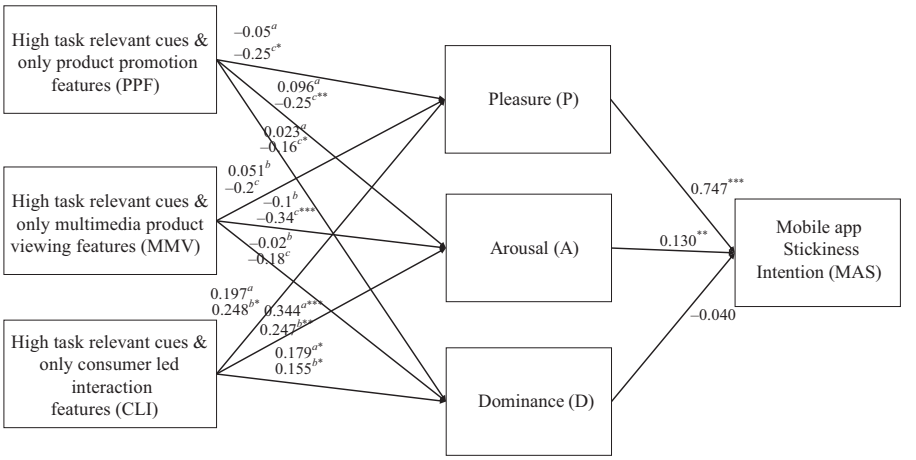

Figure 2.
Mobile design feature conceptual model

Note(s): ^{a} denotes MMV as reference group; ^{b} denotes PPF as reference group; ^{c} denotes CLI as reference group. *** is significant at $p < 0.001$; ** is significant at $p < 0.01$; * is significant at $p < 0.05$

MDF	Mediator	Hypothesis	Reference group	Effect*	*Boot SE*[a]	*LLCI*[a]	*ULCI*[b]	Significance
MMV	P	H1a	PPF	0.0378	0.0853	−0.1297	0.2061	NS
			CLI	−0.1471	0.0836	−0.3093	0.0185	NS
	A	H1b	PPF	−0.0125	0.0139	−0.0444	0.0115	NS
			CLI	−0.0447	0.0215	−0.0937	−0.0107	S
	D	H1c	PPF	0.001	0.0047	−0.0079	−0.0122	S
			CLI	0.0077	0.0089	−0.0072	0.028	NS
PPF	P	H2a	MMV	−0.0378	0.0853	−0.2155	0.1212	NS
			CLI	−0.1849	0.0885	−0.3575	−0.0133	S
	A	H2b	MMV	0.0125	0.0143	−0.0177	0.0458	NS
			CLI	−0.0322	0.0182	−0.0747	−0.0036	S
	D	H2c	MMV	−0.001	0.0047	−0.0125	0.0079	NS
			CLI	0.0067	0.0079	−0.0066	0.0252	NS
CLI	P	H3a	MMV	0.1471	0.0851	−0.0189	0.3148	NS
			PPF	0.1849	0.0905	0.0069	0.3627	S
	A	H3b	MMV	0.0447	0.0217	0.0102	0.0934	S
			PPF	0.0322	0.0182	0.0036	0.0745	S
	D	H3c	MMV	−0.0077	0.0088	−0.0279	0.0066	NS
			PPF	−0.0067	0.0082	−0.026	0.0069	NS

Table 4.
Indirect effects of pleasure (*P*), arousal (*A*) and dominance (*D*) on mobile design features and MAS

Note(s): * "Effect" is the total effect of MDF (MMV, PPF or CLI) on MAS through the mediating variable, a represents bootstrapped standard error, b represents bootstrapped lower limit of the confidence interval, c represents bootstrapped upper limit of confidence interval. MMV = multimedia product viewing features, PPF = product promotion features, CLI = consumer led interaction features; MS = not significant, *S* = significant

future studies that want to isolate pleasure response mediating MMV and stickiness could give multiple product options or allow for more consumer interactivity could lead to a more emotional response.

Second, PPF was not a significant predictor of consumers' emotional response relative to the viewing of MMV. Consumers may deem PPF as irrelevant unless they also are able to

experience MMV; however, Sina and Wu (2019) warn retailers to be wary of executing discount-based displays. On the other hand, when CLI was held as the reference group, PPF was a significant predictor of PAD. Pleasure and arousal significantly mediated the relationship between PPF and MAS relative to CLI. PPFs may only be a factor after the consumer has experienced pleasure and arousal through MMV. Therefore, consumers who viewed an app's PPF (coupons, incentives, rewards, discounts and social media promos) would yield an increase in their feelings of pleasure and arousal when controlled for CLI. Future research should analyze PPF in conjunction with purchase intentions as part of the decision-making process.

Lastly, for CLI, the findings support the importance of customized information and user-generated content to promote product offerings, supporting Poncin and Mimoun (2014) who noted the importance of user-based interactive technology elements to create an emotionally stimulating environment. CLI was an overall significant predictor of both arousal and dominance but was only a predictor of pleasure when controlled for PPF. Hence, when a consumer viewed an app's CLI, their feelings of pleasure were heightened relative to consumers who viewed PPF. Heightened feelings of arousal and dominance were present regardless of the reference group. CLI was the most significant predictor of consumers' emotional response and MAS. This suggests consumer-generated content, such as product reviews, as well as customized product suggestions elicit emotions due to the contribution of self in the experience generated. Retailers need to enhance and create tailored experiences to garner positive emotional response and MAS to increase customer base towards a retail app.

Theoretical

The current study enhances the consumer behaviour and mobile app literature by exploring the application of mobile design features to create a mobile atmosphere and its impact on behaviour. First, the study is among the first to examine mobile atmospherics. By applying the concept of atmospherics, this study extends the atmospherics literature by bridging the gap between brick-and-mortar and e-commerce atmospherics to mobile atmospherics. The study validated the application of Eroglu's high and low task-relevant cues in mobile apps by determining the elements of a mobile app that are necessary for task completion versus those that enhance the process. In particular, the findings supported the results of Eroglu *et al.* (2000) and others (Hsieh *et al.*, 2014; Koo *et al.*, 2014; Zhang *et al.*, 2015) by emphasizing the importance of low task-relevant cues in their influence of stickiness and other behavioural intentions. Thus, this finding adds to the theory of atmospherics, indicating the importance of low task design features and their impact on consumers' behaviour, specifically stickiness, which research has shown can lead to increase satisfaction, loyalty and purchasing behaviour.

Additionally, the study applied Magrath and McCormick's (2013) mobile marketing design framework by applying the four design feature groups of informative content, MMV, PPF and CLI. The findings show that applying these design features was appropriate in the mobile commerce environment and created a mobile atmosphere that generated a change in consumer emotions and/or behaviours. By applying this framework, the study bridges the gap in mobile atmospherics. In particular, the current study revealed design features elicited emotional response and influenced consumer behaviour.

Furthermore, the study is among the first to apply the SOR framework in the mobile app context, demonstrating the ability to use mobile-based stimulus in eliciting consumer response. In addition, through the usage of PAD to measure the organism, this study further supports the positive influence of pleasure and arousal in impacting behaviour. However, unlike Hsieh *et al.* (2014), the findings did not find support the inclusion of dominance despite the free nature of mobile apps.

Society

The findings of the study provided interesting implications for consumer behaviour and society as whole. CLIs were a driving feature in eliciting emotion and determining the influence on stickiness intentions. Thus, consumers trust and value the opinions of other consumers who had purchased, used and reviewed the product. Therefore, it not surprising that social media and influencers continue to gain sway on consumers. There is a unique phenomenon when strangers have such an impact on consumers' purchasing behaviour. Traditionally, fashion has been influenced by aristocracy, movie stars or famous pop culture icons (Stone and Farman, 2017), but now a fashion icon can be anyone with enough followers. This finding supports the grow realm research in social media and influencers; thus, future research should extend to analyze the impact CLI features on social media.

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