

Ehrenberg-Bass Institute Working Paper:

Mobile App Stickiness: A Review and Future Research Program

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Authors:

Dr Ioannis Kostopoulos - Liverpool John Moores University

Dr Lara Stocchi - Ehrenberg-Bass Institute

Prof. Naser Pourazad - Flinders University

Prof. Nina Michaelidou - Loughborough University



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Ioannis Kostopoulos*

Liverpool John Moores University

4-6 Rodney Street, Liverpool, UK, L1 2TQ

Email: i.kostopoulos@ljmu.ac.uk

Lara Stocchi

University of South Australia

61-68 North Terrace, Adelaide SA 5000, Australia

Email: Lara.Stocchi@unisa.edu.au

Naser Pourazad

Flinders University

GPO Box 2100, Adelaide 5001, South Australia

Email: naser.pourazad@flinders.edu.au

Nina Michaelidou

Loughborough University

Epinal Way, Loughborough LE11 3TU, UK

Email: N.Michaelidou@lboro.ac.uk

***Corresponding author**

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Abstract

This paper presents a review of existing conceptualisations and operationalisations of *mobile app stickiness* to identify discrepancies and ambiguities within the marketing literature. It highlights overlap between mobile app stickiness and two other concepts: mobile app loyalty and mobile app engagement. Subsequently, the paper outlines a future research program clarifying the most pressing conceptual and empirical work required to advance this body of knowledge. The resulting contribution is twofold. So far, mobile app stickiness has been theorised and appraised in disparate ways, often used interchangeably with other notions with a level of confusion, hindering knowledge development. At the same time, this review's practical benefits arise from: i) a concise synthesis of academic work on stickiness, facilitating comparisons with industry practices and the translation of past findings into marketing strategies; and ii) a rationalisation of the research opportunities that lie ahead, fostering potential knowledge exchange between academia and practice.

Keywords: *mobile app stickiness; mobile app loyalty; mobile app engagement; mobile app marketing; mobile app strategies.*

1. Introduction

Racherla et al. (2012) introduced *mobile app stickiness* to the marketing literature as an adaptation of website stickiness to the context of mobile apps. According to Gillespie et al. (1999) website stickiness reflects the capacity of a website to engage consumers, prolonging the time spent on it, while boosting their intention to revisit or reuse the site (Lin, 2007). Following a similar approach, early research on mobile app stickiness defined it as the ability of an app to draw and retain users (Furner, Racherla & Babb, 2014; Tarute, Nikou & Gatautis, 2017). Later studies followed a different approach, describing mobile app stickiness as the extent to which users engage with an app (e.g., frequency of use, time spent using the app, and so forth) (Yoon et al., 2022; Zhou, Rau & Jie, 2023). Regardless of the approach to mobile app stickiness conceptualisation, there is a large body of empirical work, which associates it to marketing outcomes with strategic relevance such as word-of-mouth (Aslam et al., 2021), in-app purchases (Hsu & Lin, 2016) and positive returns on investments (Zhou, Rau & Jie, 2023). Moreover, it has been suggested that mobile app stickiness is vital for the attainment of a competitive advantage for the app and via the app at the post adoption stage of the customer journey (Stocchi et al., 2022).

The pivotal role of mobile app stickiness originates, at least in part, from the dynamics involved in the interaction among between users, mobile devices and apps, especially when converging thanks to powerful digital technologies (Nandi, Nandi & Khandker, 2021). At the same time, from a practical viewpoint, mobile app stickiness is one of the most frequently used performance metrics (Yoon et al., 2022). The importance of addressing mobile app stickiness is further highlighted by the saturated app market, where users have easy access to countless choices (Bellman et al., 2011), making app stickiness a key requirement for market survival.

Despite the established theoretical and practical relevance of mobile app stickiness, there are several unclear and understudied aspects both in terms of its conceptualisation and operationalisation (Yoon et al., 2022), which past research has failed to critically discuss. Above all, mobile app stickiness has been inconsistently defined and evaluated, with significant overlap with other crucial facets of customer journeys with mobile app (Stocchi et al., 2022). To rectify these issues, the first research objective of this paper (**RO₁**) is to review existing conceptualisations and operationalisations of mobile app stickiness, highlighting discrepancies and ambiguities therein. The second research objective (**RO₂**) is to identify specific areas of conflation with two other prominent concepts: *mobile app loyalty* and *mobile app engagement*. Hence, the present review focuses on developing a narrative (e.g., Paul & Criado, 2020) about mobile app stickiness, which addresses these two research objectives using a classic Hierarchy of Effects (Lavidge & Steiner, 1961) lens. The approach affords us a parsimonious explanation of a focal concept on interest (mobile app stickiness in this instance), while highlighting discrepancies and ambiguities that need addressing, setting up a future research programme.

More broadly, the present review makes a significant contribution to the marketing literature, setting the foundations for a program of future research aimed at resolving the issues we uncover and synthesise, regards the conceptualisation, theoretical base, and dimensionality of mobile app stickiness. Furthermore, it facilitates the development of a succinct and easily comprehensible synthesis of existing knowledge on mobile app stickiness, offering considerable practical value. In this vein, this review delineates several opportunities for knowledge exchange between academia and the industry, particularly concerning data collection and analysis aimed at improving mobile apps marketing strategies.

2. Mobile App Stickiness

In the literature, there are two prominent approaches for conceptualising mobile app stickiness. The first approach views the concept as a *characteristic of the app* that influences the way users interact with it. For example, Furner, Racherla and Babb (2014) conceptualise stickiness as a quality of an app that impacts consumers' decision to use and 'stick' to it.

Early research also unveiled two major dimensions of mobile app stickiness: *vividness* and *interactivity* (Racherla et al., 2012). Vividness refers to the degree to which an app has depth (presentation quality) and breadth (sensory dimensions and signals) in creating a sense of presence. Interactivity reflects the degree to which users can instantly change the form and content of an app. Other studies have explored additional dimensions such as user control, communication, responsiveness, mobile self-efficacy, among others (Hsu & Tang, 2020). At the same time, several studies have examined app features determining stickiness such as app design, the utilitarian and hedonic value of the app, or the extent of user control, communication, and app's responsiveness (Martinez & McAndrews, 2020; Nandi et al., 2021).

The second approach to mobile app stickiness conceptualisation commonly seen in the literature links it to *users' behaviour* or *behavioural intention*. For instance, Hsu and Lin (2016, p. 45) define stickiness as: "the degree to which a user re-uses a given app and prolongs the duration of each usage". Similarly, Kim et al. (2016, p. 180) consider app stickiness as "the degree to which consumers are willing to continue using a particular mobile app". As a result, there is consensus within the literature that app stickiness can be captured with measures reflecting the use or intention to use the app. There is, however, significant disagreement on the specific aspects of app usage that should be included when operationalising mobile app stickiness. For example, according to Martinez and McAndrews (2020), mobile app stickiness should be operationalised with a combination of objective metrics such as the length of app use (tenure) or the number of repeated uses, and subjective

factors such as the intention to re-use the app. In contrast, Alnawas et al (2023) consider mobile app stickiness a reflection of the time users spent with an app, the frequency of use, and the perceptions of app's characteristics that encourage users to repeatedly use it.

The discrepancies in the conceptualisation and measurement of mobile app stickiness mirror pre-existing confusion in research conceptualising and operationalising website stickiness as well as video games stickiness (e.g., Wang, 2010; Samir et al., 2023; Chen et al., 2018; Hsiao & Chiou, 2012), domains from which mobile app research heavily borrows. However, mobile apps are characterised by several well-known peculiarities, likely to drive additional challenges and opportunities compared to other digital technologies such as websites. Specifically, the more individualised usage experiences naturally established when using mobile devices, combined with significant opportunities for personalisation and embeddedness in one's life that apps offer, create unique opportunities for user stickiness. That is, unlike websites, which users might visit sporadically and without a strong sense of loyalty, mobile apps are embedded within the daily routines (Stocchi et al., 2022). Also, the ability to personalise mobile apps enables them to tailor content and functionalities to individual users much more effectively, compared to websites (Almarashdeh et al., 2019). Additionally, purposeful user interactions with apps for specific tasks imply that stickiness in the context of mobile apps should be not just about frequent visits or prolonged use; it should also entail forming habits and/or becoming an indispensable part of one's life (Kim et al., 2016). More broadly, the concept of mobile app stickiness extends beyond simple usage metrics; it encompasses emotional attachment and identity integration (Zhou et al., 2023), both of which seem to be less pronounced in the use of other digital technologies, where stickiness might be more attuned with transactional aims.

3. Overlap with Mobile App Loyalty and Mobile App Engagement

Further to the discrepancies in mobile app stickiness research discussed so far, as Table 1 illustrates, there are additional ambiguities resulting from the overlap with *mobile app loyalty* and *mobile app engagement* in terms of definitions, theoretical bases, dimensionality, and operationalisations.

** Insert Table 1 about here **

In more detail, past studies have often treated mobile app stickiness and mobile app loyalty as synonyms (Racherla et al., 2012; Stocchi et al., 2022). Indeed, some scholars contend stickiness should be defined as the degree to which users remain loyal to an app, or the brand it represents (see Zhou, Rau & Jie, 2023). Furthermore, several studies have appraised mobile app loyalty using dimensions conceptually close to app stickiness such as the intention to remain a user and time spent on the app (Chang, 2015; Kostopoulos et al., 2023).

Mobile app stickiness has also been associated with mobile app engagement, underpinned by the premise that both concepts reflect important facets of the post adoption stage of iterative customer journeys with apps (Stocchi et al., 2022). In particular, both concepts are seen as influenced by app design quality, service quality and customer satisfaction, with a flow-on effect on word-of-mouth, re-usage intention and in-app purchase intention (Kim et al., 2016; Hsu & Lin, 2016). To discuss the closeness of these two concepts, Elsotouhy et al. (2022) recently used the Stimulus-Organism-Response (S-O-R) theory to explain how heightened app engagement leads to increased app stickiness. In particular, the authors distinguished between the two notions by highlighting that app engagement involves cognitive participation, whereas app stickiness captures short- or long-term usage intention. Accordingly, Elsotouhy et al. (2022) concluded that the user-app connection fostered by app

engagement to have stronger cognitive connotations, and the connection created by stickiness to be primarily behavioural in nature. Interestingly, the same level of overlap and conflation between mobile app stickiness, loyalty and engagement also exist within the industry, with several sources mixing these concepts. For example, Amity (2024) states: “Mobile app stickiness is a metric that measures user *engagement* with an app. It tells you how often users return to an app and how long they spend using it. A high level of stickiness means that users find value in the app and are likely to continue using it. This is important because it allows product managers to assess whether an app is providing enough weight to *keep users coming back*”. The same source then discusses the possibility to infer mobile app stickiness from daily or monthly active users, retention rates, session length and conversion rate. Similarly, AppsFlyer (2024) reports: “A sticky app holds a loyal audience, low churn, and high *engagement* when it delivers a great and unique user experience that *sets it apart from the competition*”, claiming implications for app monetization and building brand loyalty, and suggesting inferring stickiness from the ratio between daily and monthly active users. In contrast, Upshot.ai (2024) associates mobile app stickiness to the *growth of an app* and *customer life-time value*. Finally, UplandSoftware (2024) considers stickiness the *sum of app retention and engagement*, metaphorically referred to as ‘bread and butter’.

Figure 1 further rationalises the overlap between mobile app stickiness, loyalty, and engagement through a classic Hierarchy of Effects framework (Lavidge & Steiner, 1961), which delineates between *cognitive*, *affective* and *conative* aspects. This approach offers a clearer understanding of the overlap between these marketing notions across each of the triad’s elements. In more detail, the greatest overlaps stem from common cognitive origins, particularly related to latent subjective psychological and motivational aspects and common conative manifestations (e.g., continuously using/re-using the app, frequency and intensity of use or dwell time, habit formation, user retention and participation, and word-of-mouth

recommendations). There is also some overlap in affective aspects, with the main cross-over confined to value perceptions and app quality assessment. Nonetheless, unlike app loyalty and engagement, app stickiness distinguishes itself in the affective domain, emphasising communication, interactivity, app responsiveness and the facilitation of self-efficacy. In contrast, app loyalty and engagement encompass a wider range of affective aspects, such as attachment or emotional ties with the app, and customer satisfaction and service quality appraisal. Furthermore, app engagement encompasses more cognitive domain (e.g., cognitive participation and motivation experiences) as well as more conative outcomes (e.g., changes in behaviour and intention to buy in-app) compared to stickiness and loyalty.

****Insert Figure 1 about here****

Another insight Figure 1 provides, is that the delineation between the focus on app's characteristics vs. user behaviours (and behavioural predispositions) is common to all three concepts. However, what is currently lacking is a more in-depth analysis of the user perspective, looking beyond user behaviours and investigating *user characteristics* that either facilitate or hinder heightened or repeated user-to-app interactions.

4. Future Research Priorities

In consolidating the critical reflections outlined in the previous sections, we now synthesise the most pressing future research priorities. We organise future research directions in terms of i) *theoretical bases* and/or theories to be explored further in the context of mobile apps ii) the most suitable *conceptual domains* that should underpin mobile app stickiness; iii) *dimensionality* and *operationalisation* of the concept.

4.1 Theoretical Bases

When addressing the future research priorities on mobile app stickiness, it is imperative to consider theoretical bases that encapsulate user behaviours as well as individual characteristics. In particular, the dynamic interplay between user engagement with mobile apps and the intrinsic attributes of the users themselves offers a significant opportunity for theoretical exploration. This dual perspective highlights the importance of integrating theories accounting for the psychological and sociological dimensions of user interaction with technology. For example, the theory of Telepresence (Steuer, Biocca & Levy, 1995), the theory of Interactivity (Rafaeli, 1988), and the emotional responses encapsulated by Pleasure, Arousal, and Dominance (PAD) within Mehrabian and Russell's (1974) Stimulus-Organism-Response (SOR) paradigm, offer compelling lenses through which the user perspective can be studied (i.e., beyond mere behaviours and exploring individual characteristics and emotional states).

In more detail, the Telepresence Theory provides a foundational framework to understand how users experience the sense of being in an environment facilitated by technology, even when physically elsewhere. In the context of mobile apps, this sense of 'being there' can significantly enhance user engagement and stickiness by creating immersive experiences, which closely resemble real-life interactions. Future research should thus explore how varying degrees of telepresence in mobile apps influence user attachment and retention, especially as more advanced technologies like Augmented (AR) and Virtual Reality (VR), or general-purpose Artificial Intelligence (AI) become integrated into mobile devices. Similarly, Interactivity Theory (Rafaeli, 1988) emphasises the reciprocal communication between the user and the technology, where user actions elicit responses from the system. This dynamic interaction is likely a critical component of mobile app stickiness, as it fosters a sense of agency and involvement. Hence, exploring how different levels and types of

interactivity impact mobile app stickiness could provide valuable insights for both theoretical advancement and practical application in app design. Lastly, the PAD framework explains how environmental stimuli elicit emotional responses that in turn influence behaviour. In mobile app context, features, design elements, and content can act as stimuli that evoke feelings of Pleasure (enjoyment), Arousal (excitement), and Dominance (control), which can significantly impact app stickiness. Therefore, understanding the specific emotional pathways through which mobile apps engage users can help in designing more compelling user experiences that cater to emotional needs and preferences.

4.2 Conceptual Domains

There is a clear need for research contributing to the *provision of a unified, unambiguous definition* of mobile app engagement. Above all, a unified definition would need to take into account that mobile app stickiness originates from latent subjective psychological aspects capturing fundamental cognitive (e.g., perceptions of app characteristics) and motivational factors (hedonic and utilitarian). These factors lead to conative manifestations (e.g., continuously using/re-using the app, or the frequency and intensity of app use) via important affective dimensions such as value perceptions and app quality inference. Furthermore, for a more effective delineation between mobile app stickiness, loyalty and engagement, future research should explore theories that leverage *affective* aspects, especially theories capturing interaction and exchanges with the app that enhance user self-perceptions (e.g., self-efficacy, self-image, self-esteem).

While the conceptual development discussed thus far might be arguably more straightforward for specific types of apps that lend themselves to self-expansion (e.g., health and fitness apps), there are nonetheless multiple underexplored conceptual avenues. For example, mobile app stickiness might reflect the app becoming the *extension of the self*, when

it sticks/and thus implying that a user would want to stick with the app if self-expansion is possible or it is facilitated via the app. In particular, looking at the relevance of self-expansion (Aron & Aron, 1986), it has been posited that mobile apps facilitating new experiences, learning opportunities or social connections can become integrated into the self-concept. Moreover, mobile apps that align with or reinforce one's personal/social self (e.g., professional networking apps for career-oriented users such as LinkedIn) can become an integral part of how users perceive themselves and interact with the world. In essence, these conceptual perspectives highlight app stickiness can be achieved beyond personal utility, arising from facilitating self-expansion and reinforcing app users' sense of self.

Through these underexplored conceptual angles, future app stickiness studies could return models that evaluate crucial undiscovered mediating and moderating factors sharing similar cognitive and psychological origins as app loyalty and app engagement. Yet, said future research endeavours would set mobile app stickiness apart from other concepts by enhancing the explanation of the affective mechanisms, which need to onset for the attainment of outcomes above and beyond what mobile app loyalty and engagement can entail (i.e., above and beyond value perceptions, app quality, customer satisfaction and service quality; and even above and beyond the establishment of emotional ties with the app).

4.3 Dimensionality and Operationalisation

The most pressing future research priority concerning the dimensionality of mobile app stickiness revolves around the need for empirical efforts improving the understanding of drivers and outcomes of mobile app stickiness, with sufficient differentiation from existing frameworks ascribing drivers and outcomes of app loyalty and engagement. Furthermore, future empirical efforts should also concentrate on exploring in far greater detail mediators and moderators of the underlying theoretical links that shape app stickiness and its

consequences. The ultimate objective would be the provision of comprehensive and valid frameworks, which clarify what app stickiness is, and how it impacts established outcomes. Ideally, this line of enquiry should be underpinned by empirical work utilising diverse sets of data accounting for various crucial conditions, such as different data sources (e.g., panel or app analytics vs. survey data), different types of data, and comparisons over time (e.g., before and after app modifications, or across the stages of the app lifecycle) or across different contexts of app use (e.g., different geographical locations and different types of apps).

An additional issue that needs consideration concerns the interplay between mobile app stickiness' dimensions, and its antecedents and consequences. As discussed, the existing literature is not clear on whether certain concepts should be viewed as dimensions of stickiness or as external variables that interact with it. For instance, specific app characteristics (e.g., interactivity) have been considered both as dimensions of stickiness (Racherla et al., 2012) and as its drivers (Nandi et al., 2021). Future research should thus clarify such discrepancies and develop comprehensive frameworks that incorporate the dimensions of mobile app stickiness and clarify relationships with conceptually close external variables. Similarly, ambiguity exists in current studies on whether stickiness should be conceptualised as a purely behavioural construct, or if it should incorporate cognitive and affective elements. Hence, there is a need for research exploring whether stickiness should be operationalised through behavioural dimensions such as time spent on the app, in app purchases, or if it should include measures that reflect loyalty and engagement elements. Finally, future research should explore the direction of the relationship between stickiness and its dimensions, elucidating the reflective or formative nature of the construct.

5. Conclusions and Managerial Relevance

Through a concise synthesis of existing research on mobile app stickiness, this review has revealed several challenges that lie ahead for the advancement of this body of marketing knowledge. It emerged that there are important future conceptual and empirical steps to undertake, to reconcile discrepancies and to better distinguish mobile app stickiness from other related notions. Besides being positioned as a scholarly effort to steer research on mobile app stickiness, facilitating new knowledge in mobile apps marketing, the content of this review also serves as summary of what we currently know about mobile app stickiness, with significant managerial value. In more detail, given the saturated nature of mobile apps markets, it is widely accepted that monitoring stickiness is an important way to track an app's performance and, therefore, to predict the odds of market survival (Bellman et al., 2011). However, both academic work and industry practice surrounding mobile app stickiness are plagued by a level of confusion that creates a classic 'elephant in the room' situation, whereby not a single stakeholder within the *appscape* is entirely clear about the meaning and appraisal of it. To this end, the present review clarified that the contrasting approaches to the appraisal of mobile app stickiness are likely omitting to evaluate unique aspects of it (like the potential for users' self-expansion), which are fundamental to its onset and impact above and beyond related notions. With the ample opportunities for A/B testing and direct access to app usage analytics, the industry is well-positioned to explore these aspects. Hence, the present review and the pursuit of the future research avenues it maps significantly advance the scholarly and managerial value of mobile app stickiness, promoting research collaborations (e.g., knowledge and data exchange) between academia and the industry.

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Tables and Figures

Table 1: Overlap between mobile app stickiness, loyalty and engagement

	App stickiness	App loyalty	App engagement
Conceptualization	<ul style="list-style-type: none"> The degree to which an individual reuses an app, as well as the duration of usage (Hsu & Lin 2016). The level which a consumer is willing to continue using an app (Kim et al., 2016). The likelihood to continue usage (Kim et al., 2016). 	<ul style="list-style-type: none"> The sense of attachment to a mobile apps and its related services (Zhang et al., 2023). Continuously using the app, recommending the app to others, and enduring defects in its functionality (Fang, 2019). A complex interplay of emotional, social, and functional factors that collectively contribute to a user's sustained engagement with an app whereby utilitarian and hedonic dimensions both play a vital role (Tseng & Lee, 2018). M-loyalty as the willingness to continue using the app in the future and recommend it to others resulting from its design (Kumar, Purani & Viswanathan, 2018) 	<ul style="list-style-type: none"> The sum of motivational experiences (Stocchi et al. 2018) and a subjective psychological state (Fang et al., 2017). The combination of cognitive, emotional, and behavioural aspects (Dovaliene, Masiulyte & Piligrimiene, 2015; Dovaliene, Piligrimiene & Masiulyte, 2016; Jain & Viswanathan 2015). Heightened perceptions of quality (Noh & Lee, 2016). Individual participation (Tarute et al., 2017), deep focus, concentration, and absorption (Zhao et al., 2016).
Theoretical bases	<ul style="list-style-type: none"> TAM and modifications of it, TRA 		
	<ul style="list-style-type: none"> Theory of Reasoned Action Theory of Planned Behaviour 	<ul style="list-style-type: none"> VLS model. Performance expectancy U&G theory Customer relationship and experience theory Serviscape and SDL Goals and motivation theory 	
	<ul style="list-style-type: none"> Interactivity Theory, Telepresence/teletransportation theory Brand Experience Theory Information quality and system quality theories Motivation Theory SOR theory Information Adoption, and Innovation Diffusion Theory Media Flow Theory Usability Theory Expectancy Theory 	<ul style="list-style-type: none"> Brand loyalty theory Usability framework Psychological contract Information processing model from advertising SOR 	<ul style="list-style-type: none"> Media and consumer engagement theories Self-construal theory Self-brand connections theories (e.g., brand attachment theory)
Dimensionality and operationalisations	<ul style="list-style-type: none"> Stickiness has been operationalised as the length of a consumer's visit/ time spent (Lin et al., 2010; Li et al., 2021), the ability for the site to attract and retain consumers (Xu & Liu, 2010; Reichheld & Schefer, 2000; Benlian, 2015) and the number of repeated visits and usage (Li et al., 2006). 	<ul style="list-style-type: none"> Psychological factors such as intrinsic motivation, which encompasses autonomy, competence, and relatedness, have also been identified as crucial for app loyalty. For example, Soni et al. (2021) highlighted these alongside extrinsic motivators like challenges and social interactions. 	<ul style="list-style-type: none"> Wu (2015) and Kim and Baek (2018) adapted media engagement measures, while others (Tarute et al., 2017; Vayghan et al., 2022; Khan et al., 2023) concentrated on modifications of consumer engagement measures. Stocchi et al. (2018) and Bitrián, Buil & Catalán,

			<p>(2021) focused on consumer motivations and other latent psychological mechanisms, returning indirect measures of app engagement.</p> <ul style="list-style-type: none"> • App dwell time and other revealed behaviours derived from panel data (Tian, Zhou & Pelleg, 2021; Gu et al., 2022), or consumer engagement behaviours (van Doorn et al., 2010).
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Figure 1: Mobile app stickiness, loyalty, and engagement across the Hierarchy of Effects

	COGNITIVE	AFFECTIVE	CONATIVE
	Latent subjective PSYCHOLOGICAL origins (stated/self-reported cognitive and motivational aspects)	Direct user involvement, and and/or emotional ties between the user and the app	BEHAVIOURAL manifestations (stated/self-reported or revealed behaviour and intentions)
App stickiness App loyalty App engagement	<ul style="list-style-type: none"> • Characteristics of the app (some utilitarian, some hedonic) as perceived by the user – e.g., associations held in memory and/or self-reported perceptions • 'Match' with intrinsic and extrinsic user motivations, impacting behaviour by mean of shifting intentions 	<ul style="list-style-type: none"> • Value perceptions and app quality 	<ul style="list-style-type: none"> • Continuously using/re-using the app • Frequency and intensity of use or dwell time • Habit formation • User retention and participation • Word-of-mouth recommendation
App stickiness		<ul style="list-style-type: none"> • Communication and interactivity • App responsiveness • Facilitating self-efficacy 	
App loyalty		<ul style="list-style-type: none"> • Attachment to the app • Enduring app's defects/limitations 	
App engagement	<ul style="list-style-type: none"> • Cognitive participation • Sum of motivational experiences 	<ul style="list-style-type: none"> • Emotional ties to the app 	<ul style="list-style-type: none"> • Consumer Engagement Behaviours (CEBs) • In-apps purchase intention • Changes in behaviour
App loyalty App engagement		<ul style="list-style-type: none"> • Customer satisfaction • Service quality 	