

Pay with a smile? Modelling the continuance use intention of facial recognition payment

Internet Research

477

Xin-Jean Lim

*Business School, Sun Yat-Sen University, Guangdong, China and
School of Business and Economics, Universiti Putra Malaysia,
Seri Kembangan, Malaysia*

Jun-Hwa Cheah

Norwich Business School, University of East Anglia, Norwich, UK

Jennifer Yee-Shan Chang

Edge Hotel School, University of Essex, Colchester, UK

Weng Marc Lim

*School of Business, Law and Entrepreneurship, Swinburne University of Technology,
Victoria, Australia;*

*Faculty of Business, Design and Arts, Swinburne University of Technology,
Sarawak, Malaysia and*

Sunway Business School, Sunway University, Selangor, Malaysia

Alastair M. Morrison

*School of Management and Marketing, Greenwich Business School,
University of Greenwich, Greenwich, UK, and*

Yogesh K. Dwivedi

*Digital Futures for Sustainable Business and Society Research Group,
School of Management, Swansea University, Swansea, UK and
Department of Management, Symbiosis Centre for Management Studies Pune,
Symbiosis International (Deemed University), Pune, India*

Received 21 January 2023
Revised 26 September 2023
18 January 2024
2 April 2024
28 April 2024
Accepted 28 April 2024

Abstract

Purpose – This study synthesises the self-determination theory (SDT), expectation-confirmation model (ECM), and protection motivation theory (PMT) to formulate an integrated theoretical framework that elucidates the process of shaping the intention to continue using facial recognition payment (FRP) under the conditional impact of perceived technology security.

Design/methodology/approach – Data from 667 Beijing Winter Olympics visitors with FRP experience were collected through an online survey and analysed using variance based-structural equation modelling (VB-SEM).

Findings – This study reveals that the intention to continue using FRP evolves through three key stages. Initially, in the expectation stage, the multidimensional concept of artificial autonomy (sensing, thought, and action), which is underpinned by self-determination, is pivotal, strongly influencing perceptions of service enhancement and fostering trust in FRP. Subsequently, the confirmation stage underscores the importance of perceived service enhancement and trust as vital drivers in maintaining FRP usage, while also contributing to subjective well-being. Crucially, perceived technology security emerges as a key moderating factor, enhancing positive perceptions and intentions towards FRP, thus influencing its sustained adoption.

Originality/value – This study stands out by revealing the nuanced interplay between artificial autonomy and user perceptions, particularly concerning service enhancement, technology security, and trust, as they influence well-being and the continued adoption of FRP. Robustly grounded in the integrated theoretical framework of SDT, ECM, and PMT, the study's findings are critical for comprehending the core elements and specific drivers that promote sustained FRP use, especially as we consider its potential widespread



implementation. Therefore, this study not only advances theoretical understanding but also offers practical guidance for optimising FRP deployment strategies in a rapidly evolving technological landscape.

Keywords Expectation-confirmation model, Self-determination theory, Protection motivation theory, Continuance use intention, Facial recognition payment, Smart payment

Paper type Research paper

1. Introduction

Long gone are the days when using cash or credit cards were the only options for payment. With contactless payments being preferred as a result of the COVID-19 pandemic, the transition to smart payment, particularly facial recognition payment (FRP), has accelerated rapidly. Using the face as the primary physiological trait in authenticating payment, FRP has driven the payment process to a new level of convenience, as users do not need to carry a smartphone, a credit card, or even have to enter a passcode (Liu *et al.*, 2021; Maity *et al.*, 2020). As one of the world's largest emerging economies, China is frequently showcased as one of the first movers in implementing FRP, most notably through payment giants such as Alipay's Smile to Pay, WeChat's Frog Pro, and UnionPay (LinkedIn, 2021; Jao, 2019). According to iiMedia Research (2019), more than a third of China's population (± 495 million) expressed their preference to use FRP to pay for their purchases. As technology advances, this new-age contactless and biometric payment system is expected to be widely accepted and used by the public in both developed and developing economies (Lee *et al.*, 2023), such as Europe, Japan, South Korea, and the United States (ABI Research, 2020).

Compared to conventional payment systems, FRP uses biometric features to identify and measure face topography rapidly and precisely. By incorporating an artificial intelligence algorithm, the FRP system has the advantage of adjusting to lighting changes and allowing authentication from various angles. It also codes images and saves details in a database for greater efficiency, as the system can retrieve users' past transactions and process new transactions in seconds (Ciftci *et al.*, 2021). With a non-obtrusive nature, this biometric identifier makes the checkout process more relaxed and user-friendly, as user images can be obtained quickly without physical contact (Lai and Rau, 2021). Following the users' preferences, these autonomy features are not only beneficial in elevating onboarding experiences, but also in functioning as an intelligent solution for companies that intend to offer users contactless and seamless shopping experiences (Gupta *et al.*, 2023).

Studies attempting to understand the use of smart payment systems are on the rise, especially after the COVID-19 pandemic. Most studies concentrate on traditional smart payment systems such as electronic wallets, online banking, and mobile payment apps using theories such as diffusion of innovation (DOI), technology acceptance model (TAM), and unified theory of acceptance and use of technology (UTAUT) (e.g. Chakraborty *et al.*, 2022; Lim *et al.*, 2022; Sharma *et al.*, 2022), but only a few studies focus on users' acceptability and post-consumption experiences toward FRP (Li *et al.*, 2020; Moriuchi, 2021). This may be explained by the newness of facial biometric systems in the marketplace as fewer businesses have adopted such technology as compared to conventional systems (Lai and Rau, 2021).

To promote the sustainable growth of FRP, this study asserts the need for a deeper understanding of the factors contributing to the maturation of this modern smart payment system. In the information systems (IS) literature, there is a recognised discrepancy between initial behaviours (i.e. acceptance and initial use) and post-adoption behaviours (i.e. continued use). The initial step towards success is marked by the former (Shahzad *et al.*, 2024), while the latter is essential for ensuring long-term returns (Rasul *et al.*, 2023). In practical terms, businesses must develop strategies to retain existing users, particularly when the cost of acquiring new users exceeds that of retaining existing ones (Lim, 2015). Against this

background, the main motivation of this study is to explore the factors and dynamics influencing the perceptions of FRP users and their intentions to continue using FRP.

Numerous studies highlight the significance of integrating acceptance and motivational factors in technology design to cultivate user motivation, leading to favourable attitudes and desired behavioural outcomes. This study amalgamates the self-determination theory (SDT) (Ryan and Deci, 2000), expectation-confirmation model (ECM) (Bhattacharjee, 2001), and protection motivation theory (PMT) (Rogers, 1983) into an integrated theoretical framework for understanding FRP continuance behaviour. SDT probes into artificial autonomy and subjective well-being as essential motivational elements, ECM delineates the decision-making journey for FRP usage continuation, and PMT underscores protective behaviours in response to perceived risks. This triad of theories not only propels theoretical understanding but also shapes practical insights, setting the stage for an in-depth exploration of artificial autonomy, user perceptions and continuance intentions, and the nuanced role of technology security.

Firstly, this study delves into the concept of artificial autonomy as a key motivational factor, guided by the principles of SDT, to enhance users' perceptions of FRP. SDT, which emphasises the role of autonomy in fostering intrinsic motivation (Ryan and Deci, 2000), provides a theoretical underpinning for understanding how artificial autonomy can influence user adoption and interaction with smart systems (Hu *et al.*, 2021). As defined by Rijsdijk and Hultink (2009, p. 26), autonomy refers to "the extent to which a product can operate independently and in a goal-directed manner without user interference." A system achieves intelligence when it possesses a higher degree of autonomy in processing data. While existing research suggests the examination of artificial autonomy in understanding intelligent system use, its consequences and downstream effects remain insufficiently explored (Hu *et al.*, 2021). Building on the insights of Hu *et al.* (2021), this research conceptualises artificial autonomy across three dimensions – sensing, thought, and action autonomy – and investigates how the cumulative impact of artificial autonomy influences user perceptions of FRP. Given that the core objective of FRP is to enhance the efficiency and intelligence of payment processing, this investigation introduces artificial autonomy as a key ingredient of autonomous motivational factors. Furthermore, this research posits that artificial autonomy within FRP does not merely function as a technical enhancer of efficiency and intelligence but plays a pivotal role in the psychological interaction between users and technology. SDT underscores the importance of fulfilling individuals' innate psychological needs as a pathway to subjective well-being, characterised by a profound sense of contentment and psychological satisfaction (Lin and Windasari, 2019; Yu *et al.*, 2018). In this vein, the current study critically examines the mechanisms through which artificial autonomy intersects with SDT principles to amplify subjective well-being, positing that the sophistication of artificial autonomy in FRP – by attenuating uncertainties through service enhancement and bolstering trust – serves as a catalyst in transforming user experiences. This transformation, we argue, is not merely functional but deeply psychological, fostering a sense of autonomy among users. By doing so, artificial autonomy in FRP could transcend conventional boundaries, contributing not just to perceived service enhancement and trust but to a more profound, psychological state of well-being among users. This investigation is not only timely but essential, as it fills a significant gap in our understanding of the psychological dimensions of technological interactions and their implications for user-centric design and innovation in financial technologies.

Secondly, this study explores how user continuance use intentions can be shaped. Anchored in the principles of ECM (Bhattacharjee, 2001), the study proposes that autonomous motivation, specifically the sense of artificial autonomy derived from FRP usage, plays a pivotal role in cultivating positive user expectations in the initial stage, and as users progress, their opinions towards FRP performance evolve from the point of expectation to the point of confirmation. Within this study, two pertinent variables are introduced to

gauge user perceptions during the confirmation stage. To attract and retain users, service providers must transcend basic characteristics and employ effective strategies, such as emphasising the benefits and value of FRP. This emphasis is reflected in perceived service enhancement, a concept extensively explored in service research and identified as a crucial pillar for promoting a positive response to service innovation (Belanche *et al.*, 2021). Simultaneously, prior research underscores the substantial impact of users' emotions on their decision to sustain interaction with a service provider (Ashraf *et al.*, 2021). Positive user feelings towards a service often lead to a high intention for frequent usage and the development of a long-term relationship with the service provider. In response, this study incorporates trust as another pivotal factor that reflects users' emotional responses during interactions with FRP. Trust is conceptualised as the belief that the other party will adhere to appropriate behaviour (Wu and Tang, 2022). To further underscore the importance of how user continuance use intentions are shaped in FRP, this research examines the potential positioning of perceived service enhancement, trust, and subjective well-being as sequential mediators in enhancing the connection between artificial autonomy and post-adoption behaviour.

Finally, in our extended inquiry, guided by the principles of PMT, which posits that individuals exhibit protective behaviours in response to perceived threats (Rogers, 1983), we delve deeper into the ramifications of perceived technology security in FRP. PMT is particularly relevant in discerning whether technological security serves as a deterrent factor, influencing the restrained adoption of FRP. In particular, our study aims to highlight a pressing and emerging issue which is the necessity for a thorough comprehension of how users navigate security concerns in the evolving landscape of FRP. This landscape is marked by increasing autonomy, complexity, intractability, and opaqueness (Lim, 2023; Rahwan *et al.*, 2019) of smart payment. Although FRP algorithms have the potential to enhance service quality, our study raises a consequential drawback: the suboptimal onboarding experience for new users. Industry surveys underscore the dual impact of FRP, providing convenience to users while also presenting threats to data security alongside personality, portrait, and property rights (Liu, 2019). This duality aligns with the fundamental principles of the PMT (Rogers, 1983), asserting that individuals inherently manifest protective behaviours and engage in countermeasures in response to perceived risks. Hence, we introduce perceived technology security as a conditional factor, providing a novel perspective on how security threats can influence users' inclinations to either continue or discontinue using FRP. This nuanced exploration not only offers theoretical clarity of complex relationships but also carries practical implications for system developers of FRP. As a result, these findings are expected to provide a foundation for tailored recommendations that strike a balance between the potential benefits of FRP with the need for robust security measures.

2. Theoretical foundation

2.1 Self-determination theory (SDT)

To analyse the distinct characteristics that differentiate FRP systems from traditional payment methods, this study adopts SDT, which is one of the most widely used theories for exploring motivational factors that influence users' intentions to adopt various technologies. Arghashi and Yuksel (2022, p. 3) stated that "motivational factors" are crucial in predicting technology adoption. According to SDT, individuals are more likely to be intrinsically motivated to adopt an innovation when their fundamental needs are met (Ryan and Deci, 2000). This theory has been widely used to understand the motivations (or deterrents) to using various emerging technologies in recent times, including AI-powered conversational agents (Jan *et al.*, 2023), anti-food waste apps (Cassia and Magno, 2024), and travel-tracking apps (Medeiros *et al.*, 2022), among others.

To comprehend the use of FRP, it is crucial to emphasise the impact of autonomous motivation. Artificial autonomy, which includes action, sensing, and thought autonomy, aligns seamlessly with the focus on autonomy in SDT and is considered one of the most critical attributes for evaluating the effectiveness of AI-based innovations. Artificial autonomy refers to a system's ability to perform tasks previously done by humans without explicit assistance (Parasuraman *et al.*, 2000). The level of autonomy is considered higher when the system can execute a larger portion of tasks with minimal human intervention. In the case of FRP, users' motivation is heightened when this innovation is embedded with a high degree of artificial autonomy. Specifically, the system's ability to process biometric features, including detection (e.g. scanning the face), analysis (e.g. assessing the data), and recognition (e.g. verifying the information), can contribute to users' autonomous motivation. This characteristic is a crucial success factor in shaping positive user expectations toward FRP, particularly when users experience the benefits of the biometric authentication system during check-out (Moriuchi, 2021). To conceptualise the application of artificial autonomy, this study uses three taxonomies: action, sensing, and thought to elaborate on how well FRP performs various aspects of its task.

Action autonomy entails an artificial system's ability to interact autonomously with significant elements in its environment, such as managing applications or devices, processing or verifying user data, and authenticating payment procedures (Pianca and Santucci, 2023). This form of autonomy ideally positions FRP to represent its users and fulfil their requests effectively.

Sensing autonomy pertains to an artificial system's ability to perceive and interpret its environment independently. Within FRP, sensing autonomy is crucial, encompassing the system's proficiency in actively and accurately acquiring sensory data, such as scanning users' faces or gauging their expressions (Formosa, 2021).

Thought autonomy relates to an artificial system's ability to accurately address users' queries without requiring human intervention (Müller, 2012). This feature is crucial in providing personalised and precise suggestions that align with users' preferences and requirements.

Moreover, SDT delves into the dynamics between the fulfilment of individuals' intrinsic needs – such as autonomy, competence, and relatedness – and the alignment of these needs with their personal aspirations and values (Ryan and Deci, 2000). This alignment is posited as a cornerstone for fostering a deep-seated sense of subjective well-being. The critical role of this theoretical linkage in understanding the motivational underpinnings of technology adoption and its subsequent impact on users' psychological states has been cogently discussed by Yu *et al.* (2018) and further elaborated by Buzinde (2020). These discussions underscore the importance of considering subjective well-being not merely as a peripheral outcome but as a central element in the adoption and sustained use of technological innovations, including FRP. This perspective encourages a re-evaluation of technology adoption models (Lim, 2018), urging them to integrate well-being as a fundamental metric alongside traditional measures of efficiency and utility.

Given this discussion, this study integrates the multidimensional concept of artificial autonomy as a key autonomous motivation variable and positions the concept of subjective well-being as a critical evaluative motivation. This strategic integration allows the study to delve into how the initial expectations of artificial autonomy contribute to the satisfaction and subsequent confirmation of those expectations through the lens of subjective well-being. By examining the interplay between these constructs, this study illuminates the ways in which users' perceptions of FRP evolve as they transition towards the confirmation stage, as delineated by ECM. This approach not only enriches understanding of technology adoption dynamics but also underscores the significance of subjective well-being as an essential, yet often overlooked, dimension in the evaluative processes underpinning user satisfaction and technology acceptance.

2.2 Expectation-confirmation model (ECM)

The expectation-confirmation model (ECM) is a cognitive model that explains the cognitive processes individuals undergo when making decisions related to IS continuance (Bhattacharjee, 2001). The model investigates the long-term factors that support the reuse of the system. This theory has been applied in IS studies examining users' satisfaction and intention to continue using various innovations, including cryptocurrency (Arpaci, 2023), digital payment (Bhatia *et al.*, 2023; Franque *et al.*, 2023), and electronic banking (Rahi *et al.*, 2023). Bhattacharjee (2001), the founder who proposed the process, delineates that users forming continuance intention undergo three core stages: expectation, confirmation, and continuance (commonly used post-adoption behaviour).

Expectations, in the context of FRP, refer to pretrial beliefs about the payment system. These beliefs, shaped by anticipated behaviour, serve as benchmarks against which the system's performance is assessed (Yang *et al.*, 2023). Initial expectations about FRP are established before its first use, with prior experience and existing knowledge leading to more realistic expectations. However, a lack of first-hand experience may result in expectations derived from alternative sources, such as feedback from existing users, opinion leaders, media reports, or marketing initiatives (Wolverton *et al.*, 2020). Regardless of their source, these initial expectations provide benchmarks for evaluating the future performance of FRP.

Confirmation or disconfirmation judgement is formed when individuals compare perceived performance to their initial expectations, forming a confirmation judgement (Meng-Lewis *et al.*, 2024). There are three potential outcomes that may arise at this stage: negative disconfirmation, positive disconfirmation and simple confirmation (Mishra *et al.*, 2023; Oliver, 1980). Negative disconfirmation happens when actual performance falls short of expectations, while positive disconfirmation happens when actual performance exceeds expectations. Simple confirmation takes place when actual performance aligns with expectations.

Post-adoption behaviour encompasses the actions and decisions individuals make after utilising a specific information system, software, or technology. The examination of post-acceptance behaviour (i.e. continued use) is considered more influential than pre-acceptance behaviour (i.e. intention to use) for the following reasons: From the demand side, post-acceptance behaviour, particularly the assessment of continuance use intention, holds greater significance as compared to pre-acceptance measurements like intention to use because pre-acceptance measures are based on perceptions, while post-acceptance behaviour reflects the tangible actions of users. Moreover, users who are willing to continue using IS can play a crucial role in influencing potential future users. Their positive feedback and recommendations can create a ripple effect, shaping the perceptions and decisions of those considering its adoption. From the supply side, the potential for higher revenues through an upsurge in persistent usage by satisfied users, wherein continued and increased use by this demographic contributes to greater returns.

While ECM exhibits notable strengths, particularly in elucidating IS continuance behaviours (Gupta *et al.*, 2020), it is considered somewhat parsimonious as it primarily focuses on three general constructs (i.e. expectations, confirmation, and continuance) and overlooks important context-based variables. Recognising this limitation, Bhattacharjee (2001) in his revised work acknowledged the imperative to enhance the model for a more comprehensive understanding of continuance intention. To fill this gap, a growing body of research underscores the necessity of expanding ECM by incorporating additional contextual factors. Studies have shown that the explanatory power of continuance use intention significantly improves when ECM incorporates supplementary variables (Oghuma *et al.*, 2016). These findings highlight the significance of adopting a broader perspective that incorporates context-based considerations to achieve a more nuanced and accurate portrayal of users' behavioural continuance patterns. Therefore, this study endeavours to expand ECM,

offering a more comprehensive and holistic framework for comprehending and predicting Internet Research user behaviours when using FRP.

2.3 Protection motivation theory (PMT)

The core tenet of the PMT posits that individuals take proactive measures or engage in specific behaviours to mitigate perceived threats, wherein these threats primarily originate from a convergence of information inputs, encompassing verbal communication, observational learning, and past experiences (Rogers, 1983). Expanding the application of PMT to the individual level, researchers have extensively employed it to understand how individuals protect themselves in online security behaviours (Al-Balushi *et al.*, 2024) and the usage of personal device security (Chennamaneni and Gupta, 2023; Skalkos *et al.*, 2024).

In the context of utilising a smart payment device, an individual's threat appraisal is activated if they perceive a vulnerability to the potential loss of personal data (Alalwan *et al.*, 2024). This critical juncture prompts individuals to engage in a cognitive process that involves a cost-benefit analysis (Hijazi and Abudaabes, 2023). They carefully weigh the risks associated with non-protective behaviour against the costs involved in mitigating these risks. Through this analysis, people make a conscious decision whether to continue or discontinue the use of the smart payment device.

To further explore this outcome, this research employs PMT to elucidate the potential impact of perceived technology security on altering FRP usage. Perceived technology security refers to users' potential concerns regarding the safety and security of transactions and data shared over a platform when using a technology. Pagani and Malacarne (2017) argue that users' perception of technology security can be categorised into two main types: security intrusions by companies attempting to obtain and use personal information for marketing purposes, and security intrusions involving spammers, viruses, and pirates. Drawing from related literature (Nguyen *et al.*, 2021; Zhong *et al.*, 2021), this study posits that although users may have a favourable attitude when using FRP, perceived technology security holds a significant influence on those who are reluctant to use FRP due to security concerns.

3. Conceptual foundation and hypotheses development

3.1 Expectation stage: artificial autonomy

The relationship between artificial autonomy and its ability to act as an independent motivator for improving perceived service quality in FRP is supported by SDT. SDT suggests that autonomous motivation is crucial in shaping a positive user experience (Ryan and Deci, 2000). In the context of FRP, heightened autonomous motivation arises from the system's precision in executing transactions seamlessly without human intervention across three dimensions: sensing, thought, and action (Talluri *et al.*, 2013). For example, a heightened level of sensing autonomy in FRP reinforces the system's automation and contactless transaction nature (Hu *et al.*, 2021). As users approach the payment terminal, the system recognises their facial features automatically, without requiring any explicit actions. This frictionless and straightforward payment process significantly enhances user convenience, contributing to an elevated perception of service quality (Zhou, 2014). Additionally, the system provides a substantial degree of thought autonomy, guiding users through the payment process and offering intuitive and intelligent transaction services. By providing relevant and tailored recommendations, the payment process can become more efficient (Al-Maliki and Al-Assam, 2021). This is consistent with prior studies on online banking, which highlight the importance of personalisation in enhancing the perceived quality of service provided by intelligent service systems (Zhang *et al.*, 2023). Furthermore, FRP

systems with high levels of autonomy ensure precise transaction execution, resulting in a seamless and efficient service experience for users (Talluri *et al.*, 2013). Based on these observations, this study suggests that artificial autonomy is crucial in enhancing the positive service perception associated with FRP. This leads us to propose the following hypothesis:

H1a. Artificial autonomy positively impacts perceived service enhancement in FRP.

This study also extends the hypothesis based on the foundational principles of SDT, positing that the establishment of trust in utilising FRP is fundamentally linked to the fulfilment of autonomous motivation. Building on previous research, a payment system with significant autonomy in its actions has features that make payment transactions more intuitive, reliable, and less prone to errors, thereby fostering trust among users (Liébana-Cabanillas *et al.*, 2014). For instance, a high level of sensory autonomy enables users to have control over the collection and utilisation of sensory data within FRP. Empirical findings indicate that when users perceive control over the accumulation of sensory data, their privacy sentiment is positively influenced (Kong *et al.*, 2019). This assurance of judicious data management in accordance with user preferences catalyses heightened trust in the technology (Lacity *et al.*, 2024). Similarly, a high degree of thought autonomy indicates the system's proficiency in offering relevant and valuable advice to FRP users. In the IS field, the competence of a smart service system in tailoring responses to individual preferences is recognised as pivotal in fostering trust during human-computer interactions (Nwankpa and Datta, 2022). Essentially, when users feel that they have control over the system's feedback, their trust in both the system and the underlying technology is strengthened. Stemming from these observations, we posit the following hypothesis:

H1b. Artificial autonomy positively impacts trust in FRP.

3.2 Confirmation stage: perceived service enhancement

The optimisation of services constitutes the delivery of superior experiences that instil a sense of value among users (Chang *et al.*, 2022a). This perception plays a pivotal role in fostering the adoption of innovative technologies, providing companies with a strategic rationale for integrating cutting-edge systems into their regular operations (Wang *et al.*, 2022). Drawing specific parallels to online banking, Geebren *et al.* (2021) noted that emerging banking systems, characterised by commendable service precision, are more adept at meeting user expectations and consequently elevating their overall life quality. It follows that the perceived enhancement of services through FRP usage could also have a positive impact on users' subjective well-being.

The inherent convenience and efficiency of FRP, exemplified by the seamless execution of transactions through facial scans, have the potential to alleviate user frustration, eliciting positive emotions and amplifying the sense of well-being (Aboelmaged *et al.*, 2021). Additionally, the system reduces cognitive burden by eliminating the need for password recall or PIN entry, resulting in a more streamlined and enjoyable payment experience. Hence, FRP grants users greater control over their financial transactions, merging cutting-edge technology with transactional autonomy. This newfound autonomy is associated with increased contentment and happiness, further bolstering subjective well-being. Furthermore, the refined user experience offered by FRP, particularly resonates with technology enthusiasts, can evoke positive sentiments, contributing to the overall enhancement of an individual's well-being (Henkens *et al.*, 2021). Taking these conclusions into account, the study hypothesises:

H2a. Perceived service enhancement positively impacts users' subjective well-being in FRP.

Previous research has highlighted the significance of delivering superior services to build trust in target markets, thereby laying a robust foundation for the enduring success of cutting-edge systems in financial exchanges (Wunderlich *et al.*, 2013; Zhang *et al.*, 2023). However, there remains a noticeable research gap regarding the relationship between perceived service enhancement and users' sustained intention to use new payment mechanisms, particularly FRP. To bridge this gap, this study argues that perceived service enhancement directly fosters continued FRP utilisation, drawing on four key empirical insights.

Firstly, users are inclined to enjoy a superior experience when they perceive that FRP surpasses alternative payment modalities in terms of convenience, ease of use, and speed. According to Venkatesh *et al.* (2003), a positive user experience enhances enjoyment and satisfaction, leading to a positive attitude towards the technology and encouraging continued usage. Secondly, it is pivotal to acknowledge the various functional merits that are encompassed within perceived service enhancement, such as enhanced dependability, efficiency, and precision. As posited by Liébana-Cabanillas *et al.* (2014), acknowledging these benefits strengthens trust in the technology's prowess, propelling its sustained adoption. Thirdly, FRP's inherent straightforwardness and cognitive unburdening lead to cognitive ease, which fosters a favourable service perception. In agreement with this, Köse *et al.* (2019) argue that cognitive ease guides user views on technology usability, promoting its continued use. Lastly, perceived service enhancement can amplify the enjoyment of technology usage. This is consistent with TAM (Davis *et al.*, 1992), which suggests that enjoyable interactions with technology can lead to increased intrinsic motivation for continued engagement. In alignment with these insights, the study proposes the following hypothesis:

H2b. Perceived service enhancement positively impacts continuance use intention of FRP.

3.3 Confirmation stage: trust

Considering that users are both thinkers and feelers who use both cognitive and affective processing in deciding whether to adopt something, in this case, FRP, this study conceptualises trust as a high-order construct, entailing cognitive and emotional trust (Shi *et al.*, 2021; Wu and Tang, 2022). Cognitive trust pertains to the user's confidence in, and willingness to rely on, a service provider. This arises from rational reasoning and evaluation when a focal partner is perceived as competent, meeting the user's obligations consistently (Johnson-George and Swap, 1982). In contrast, emotional trust relates to users' faith in an entity, rooted in the care and concern demonstrated by the service provider (Wu and Tang, 2022). It embodies more instinctual feelings and the depth of a relationship with a focal partner, with heightened emotion fostering a favourable attitude towards technology adoption (Gursoy *et al.*, 2019; Wu and Tang, 2022).

Conventionally, IS research posits trust as a subjective assurance that augments future behaviour (Leong *et al.*, 2022). Such trust can dilute psychological reservations tied to digital transactions (Shahzad *et al.*, 2024). As Chakraborty *et al.* (2022) assert, if users are convinced that a system can reliably render the expected services, they are inclined to harbour positive sentiments towards it, potentially enhancing their quality of life. Extending this thought to FRP, if users are assured that their biometric data is robustly safeguarded and exclusively used for payment verification, it can alleviate anxieties around potential data violations, cultivating positive subjective well-being. Simply put, if users feel they exert control over the payment mechanism and can seamlessly fine-tune their preferences, it may foster a heightened sense of autonomy, boosting their subjective well-being (Zhong and Mitchell, 2012). Building upon this logic, this study anticipates that consistent and smooth performance by FRP will bolster user trust, positively influencing their subjective well-being. Hence, the forthcoming hypothesis is postulated:

H3a. Trust positively impacts users' subjective well-being in FRP.

Bhattacharjee's (2001) ECM solidified the idea that amplified levels of trust correlate with heightened intentions to persist with a technology. In the context of mobile payment systems, trust holds pivotal sway over users' resolutions to remain on these platforms. For instance, Lim *et al.* (2022) unearthed in their study on e-wallet adoption that users' continuance intentions were profoundly moulded by their trust in the system's security and dependability. Shao *et al.* (2019) empirically underscored, in a Chinese context, that customers' perceptions of a trustworthy mobile payment platform positively shaped their continuance intentions. With regard to FRP, trust functions as a risk mitigator, influencing users' decisions to sustain its use. When users perceive FRP as trustworthy and confident in its reliable performance and data protection, this foundational trust augments their positive perceptions of the technology. This, in turn, steers their intentions to persist with FRP. On this premise, the next hypothesis is set forth:

H3b. Trust positively impacts continuance use intention of FRP.

3.4 Subjective well-being

Innovations are likely to foster a high level of subjective well-being when users can experience positive affection (e.g. happiness, satisfaction) following their adoption (Diener, 1984). Noteworthy, a person experiencing a high level of subjective well-being is likely to exhibit continuance usage, as they tend to perceive that the innovation improves their lives (Yoon, 2014). This can be explained by the logic that people may be swayed more by emotional rather than rational responses (Kim and Shin, 2015). Despite this concept continuing to receive attention in IS research, research on the consequences of subjective well-being from the use of smart payment systems remains emerging and scarce. In a recent study, Lim *et al.* (2022) observed that users of electronic wallets that offered benefits such as low cost and personalised services are more likely to display a higher level of well-being (or maximise user pleasure) and exhibit a greater intention to continue using that payment method. By extension, the current study proposes subjective well-being as a salient driver that significantly affects FRP's continued usage. With the integration of biometric authentication into the payment system, the employment of FRP can improve the intelligence and efficiency of user data processing, with the system allowing users to "show their face" and leave thereafter. This system is expected to improve the lives of users and arouse their interest to continue using FRP. Therefore, the following hypothesis is proposed:

H4. Users' subjective well-being positively impacts continuance use intention of FRP.

3.5 Sequential mechanism: perceived service enhancement, trust, and subjective well-being

The aforementioned hypotheses indicate three sequential mediations involving perceived service enhancement, trust, and subjective well-being on the relationship between artificial autonomy with the continuance use intention of FRP. These sequential mediations are articulated and supported with nuanced rationales from extant literature.

First, service enhancement is a significant consideration for users, particularly in adopting an innovation. Providing consistent and reliable services with minimal errors are core factors for service providers to gain a competitive advantage (Lu *et al.*, 2019). Several studies have advocated the possibility that perceived service enhancement may influence user judgements of banking services, and users who perceive that the quality of service is superior may reciprocate with a profound level of loyalty (Chang *et al.*, 2022b; Twum *et al.*, 2023). It is, therefore, plausible that service enhancement may serve as an underlying mechanism for improving the relationship between FRP features and continued usage.

Second, existing research suggests that user experience is a key influencing factor in explaining and predicting why people continue or discontinue using a particular intelligent

technology (Javornik *et al.*, 2022). Generally, if users consider the adoption journey to be pleasant, they will show a high level of satisfaction with the technology's functionality, resulting in continuance use intention (Fang *et al.*, 2021; Lim *et al.*, 2022). This study postulates that the impact of FRP features on continuance usage is significantly determined by subjective well-being, in which users who perceive a higher degree of pleasure when using FRP are more likely to appreciate the system and use it for transactions.

Third, trust is another important element in understanding how people continue using certain technologies, as it plays an important role in reducing uncertainty (Shahzad *et al.*, 2024). For smart payment systems, trust reassures users of a stable relationship with the service provider and ensures that they will continue on the same platform instead of switching to others (Geebren *et al.*, 2021). In this regard, this study proposes trust as a mechanism in the relationship between artificial autonomy and the continuance usage of FRP.

Taken collectively, these rationales support the formation of the following hypotheses:

- H5. The relationship between artificial autonomy on the continuance use intention of FRP is sequentially mediated by perceived service enhancement and subjective well-being.
- H6. The relationship between artificial autonomy on the continuance use intention of FRP is sequentially mediated by trust and subjective well-being.

3.6 Conditional effect: perceived technology security

Perceived technology security holds significance in the initial acceptance and continued adoption of electronic or smart payment technologies, as individuals naturally prefer secure channels for monetary transactions, ensuring the protection of their financial information. This aligns with previous studies showing that perceived technology security motivates the use of technology for managing monetary transactions (Duan and Deng, 2022; Lim *et al.*, 2022). Specifically, online transaction technologies with a high level of perceived technology security are believed to protect users from potential financial losses and security threats, enhancing users' trust and subjective well-being (Lim *et al.*, 2022). This became particularly evident during the COVID-19 pandemic, where social distancing measures increased reliance on FRP for effective and efficient monetary transactions, thereby reinforcing the significance of perceived technology security.

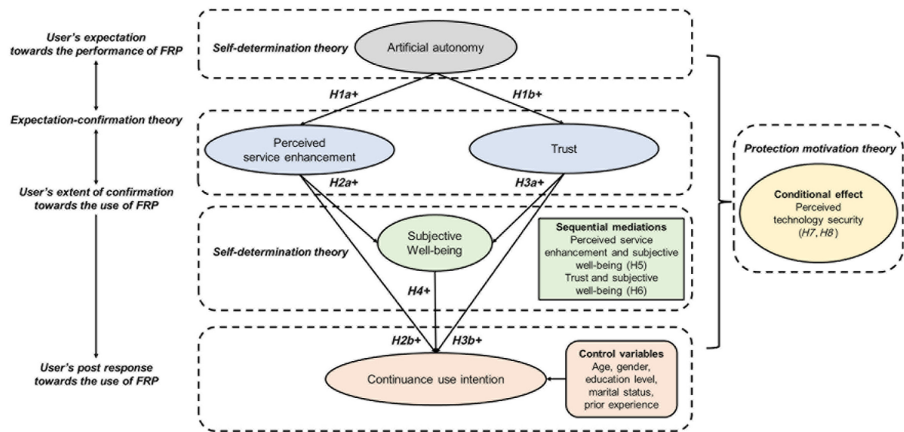
Considering this discussion, we posit that perceived technology security significantly strengthens the sequential mediators of trust and subjective well-being between artificial autonomy and the intention to continue using FRP. These hypotheses are presented as follows:

- H7. Perceived technology security moderates the sequential mediators of perceived service enhancement and subjective well-being between artificial autonomy and continuance use intention of FRP, such that the sequential mediating effect is strengthened when perceived technology security is high.
- H8. Perceived technology security moderates the sequential mediators of trust and subjective well-being between artificial autonomy and continuance use intention of FRP, such that the sequential mediating effect is strengthened when perceived technology security is high.

3.7 Control variables

In this study, age, gender, education level, marital status, and prior experience in using FRP are used as control variables to avoid spurious explanations in our proposed hypotheses (Figure 1). As noted in IS literature, female and highly educated users from a young age are often technology savvy (Lim *et al.*, 2022). Additionally, single individuals generally have

Figure 1.
A self-determination, expectation-confirmation, and protection motivation theory for facial recognition payment (FRP)



Source(s): Authors' own illustration

lower financial commitments and thus have higher risk tolerance in trying new payment technology and a lower fear of monetary loss (Ratchford and Ratchford, 2021). Individuals who are more familiar with or have experience with comparable technologies, such as face recognition, are more likely to continue using the system (Lim *et al.*, 2021).

4. Methodology

4.1 Instrumentation

A questionnaire was developed with items measuring the demographic and research variables. All items were modified based on reliable scales and rated on a seven-point Likert scale, with a higher value indicating stronger agreement (Appendix Table A1). Artificial autonomy was captured using three dimensions (i.e. action, sensing, and thought autonomy) and the scale was adapted from Hu *et al.* (2021). Items for perceived technology security were adapted using the scale suggested by de Luna *et al.* (2019). Items for perceived service enhancement were adapted using Belanche *et al.*'s (2021) scale, while trust was specified as a reflective-formative second-order construct that captures two dimensions (i.e. cognitive and emotional trust), as suggested by Shi *et al.* (2021). The items in Kim and Hall's (2019) study were used to measure subjective well-being, whereas the items suggested by Yang and Jolly (2009) were used to assess continuance use intention.

4.2 Ethics, pre-test, and pilot study

The university's ethics committee approved the questionnaire and sampling procedures prior to data collection. To minimise the error of the survey, the questionnaire was pretested by a panel of experts, thereby establishing content validity. Following that, a total of 50 respondents with FRP experience were invited to a pilot study, thereby establishing face validity. Some items were refined for greater clarity based on the feedback received at the pre-test stage before proceeding to the pilot study, and the same process ensued for the pilot study before progressing to the main study.

4.3 Context of study

To test the proposed hypotheses, we surveyed international visitors who attended the Beijing Winter Olympics in 2022. This mega-event was selected because it was equipped with

futuristic technologies such as FRP to provide a transformative user experience. In addition, China ranks among the top in Bloomberg’s 2020 innovation rankings for upper-middle-income economies (Li *et al.*, 2022a; World Intellectual Property Organization, 2021) and has a high degree of openness in testing and adopting new technologies (Hsu *et al.*, 2018). A structured questionnaire was developed to collect data from international visitors who joined the event between 4 February 2022 and 20 February 2022, and had experience in using FRP more than three times when making purchases (i.e. food and beverages, souvenirs) during the mega-event. With the practice of social distancing, respondents were asked to scan the QR code to access the survey via Wenjuanxing (www.wjx.cn), one of the largest online survey platforms in China.

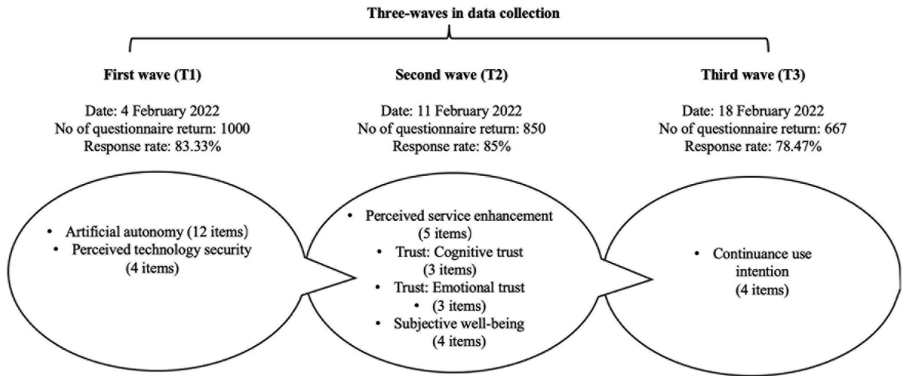
4.4 Sampling and procedures

To address common method bias (CMB) and bolster confidence in our hypothesis outcomes, we adopted a time-lagged strategy over three waves, spaced a week apart (Figure 2). In the first wave, we collected data for three dimensions of artificial autonomy (i.e. action, sensing, and thought autonomy) and the moderator (i.e. perceived technology security), whereas data for perceived service enhancement, trust, and subjective well-being, as well as the outcome variable (i.e. continuance use intention) was collected in the second and third waves, respectively.

Initially, 1,200 visitors who met the criteria were invited to the survey. All visitors were informed that their participation would be anonymous and voluntary, and that they could leave the survey at any time without consequences. In the first wave (4 February 2022), 1,000 respondents returned the survey (response rate of 83.33%). For the second wave (11 February 2022) and third wave (18 February 2022), the total returned responses were 850 (85% response rate) and 667 (78.47% response rate), respectively. From the 667 valid responses received, the majority of respondents were female (55.92%), single (57.12%), aged between 18 and 25 years (41.53%), held a bachelor’s degree (77.21%), lacked prior experience in using facial recognition technology (64.77%), and were from the United States (21.29%) (Table 1).

5. Results

The data was first analysed using SPSS to assess demographic profiles and CMB. Hypothesis testing was then conducted using variance based-structural equation modelling (VB-SEM) via SmartPLS4 (Cheah *et al.*, 2024; Hair *et al.*, 2022). VB-SEM is recognised as a quasi-



Source(s): Authors’ own illustration

Figure 2.
Three-waves data
collection

Table 1.
Demographic profile of
survey respondents

Demographic	Category	<i>n</i> = 667	%
Age	18–25 years	277	41.53
	26–29 years	221	33.13
	30–35 years	169	25.34
Education level	Bachelor's degree	515	77.21
	Master's degree	135	20.24
	Doctorate degree (e.g. DBA/ PhD)	17	2.55
Gender	Female	373	55.92
	Male	294	44.08
Marital status	Single	381	57.12
	Married	286	42.88
Nationality	Canada	113	16.94
	Germany	96	14.39
	Italy	69	10.34
	Japan	25	3.75
	Sweden	63	9.45
	Switzerland	119	17.84
	United States	142	21.29
	Others	40	6.00
	Yes	235	35.23
	No	432	64.77
Do you have any prior experience of using facial recognition technology?			

Source(s): Authors' own illustration

technique in IS research that is useful for maximising the variance explained in latent dependent variables (Lim *et al.*, 2022; Song *et al.*, 2021). We employed VB-SEM for three reasons. First, VB-SEM aligns with our research goals, which lean towards theory-building rather than purely confirmatory purposes, as it is adept at testing and exploring models (Shiau *et al.*, 2019). Second, past research underscores VB-SEM's proficiency in handling complex variables, particularly higher-order constructs. For instance, artificial autonomy and trust in our study are conceptualised as reflective-formative types of higher-order constructs (Becker *et al.*, 2023). Moreover, Cheah *et al.* (2021) found that VB-SEM excels in assessing research models populated with numerous constructs and complex relationships, such as the conditional mediation effect of perceived technology security. Third, VB-SEM outperforms its counterparts when the research goal is predictive or exploratory (Hair *et al.*, 2022), characteristics that resonate with our study (Shmueli *et al.*, 2019).

5.1 Common method bias (CMB) evaluation

Significant measures were implemented to mitigate CMB. Procedurally, the survey offered precise contextual details on the cover page, provided clear instructions to clarify uncertain or ambiguous terms, assured respondents of their anonymity to alleviate discomfort or apprehension, and sourced data from multiple intervals (MacKenzie and Podsakoff, 2012). Importantly, our focus was on existing users of FRP, aiming to enhance the validity of their responses.

We undertook three statistical assessments to test for CMB: Harman's single factor test (MacKenzie and Podsakoff, 2012), the full collinearity test (Kock and Lynn, 2012), and the unmeasured latent method construct (ULMC) test (Chin *et al.*, 2012). Harman's single-factor test showed that the variance explained by the first factor was 38.927%, below the threshold value of 40%. The full collinearity test indicated variance inflation factors (VIFs) between 2.040 and 3.297 (Table 2), well within the acceptable limit of 3.3, suggesting CMB is not problematic in this study (Kock and Lynn, 2012). For the ULMC, detailed in Appendix

								Internet Research
Construct	Item	Loading	CA	rho_A	CR	AVE	FC	<div>491</div>
Action autonomy (AA) (T1)	AA1	0.897	0.917	0.917	0.941	0.800	2.040	
	AA2	0.884						
	AA3	0.906						
	AA4	0.891						
Sensing autonomy (SA) (T1)	SA1	0.870	0.887	0.887	0.922	0.747	2.110	
	SA2	0.879						
	SA3	0.868						
	SA4	0.840						
Thought autonomy (TA) (T1)	TA1	0.840	0.886	0.886	0.921	0.745	2.141	
	TA2	0.883						
	TA3	0.871						
	TA4	0.859						
Perceived technology security (PTS) (T1)	PTS1	0.938	0.946	0.947	0.961	0.861	3.275	
	PTS2	0.930						
	PTS3	0.916						
	PTS4	0.926						
Perceived service enhancement (PSE) (T2)	PSE1	0.780	0.879	0.882	0.912	0.674	2.156	
	PSE2	0.831						
	PSE3	0.836						
	PSE4	0.816						
	PSE5	0.841						
Trust: Cognitive trust (CT) (T2)	CT1	0.898	0.880	0.881	0.926	0.806	2.541	
	CT2	0.904						
	CT3	0.892						
Trust: Emotional trust (ET) (T2)	ET1	0.925	0.915	0.915	0.946	0.854	3.093	
	ET2	0.917						
	ET3	0.930						
Subjective well-being (SWB) (T2)	SWB1	0.907	0.928	0.929	0.949	0.822	3.297	
	SWB2	0.926						
	SWB3	0.923						
	SWB4	0.869						
Continuance use intention (CUI) (T3)	CUI1	0.934	0.938	0.939	0.956	0.844	3.256	
	CUI2	0.925						
	CUI3	0.923						
	CUI4	0.892						
Note(s): T1 = Time 1. T2 = Time 2. T3 = Time 3. CA = Cronbach's alpha. CR = Composite reliability. AVE = Average variance extracted. FC = Full collinearity								Table 2. Assessment of reliability, convergent validity, and full collinearity
Source(s): Authors' own illustration								

Table A2, all substantive loadings were significant, with most method loadings being insignificant or holding minimal values, barring exceptions for TA1, PTS1, PSE2, PSE4, PSE5, CT2, and CUI2. The variance ratio between substantive and method was a significant 94.10:1, further confirming CMB was not an issue. Collectively, these tests assured that CMB did not pose concerns for our study.

5.2 Measurement model evaluation

As part of the measurement model evaluation, the study's constructs were examined through Cronbach's alpha (α), rho_A, composite reliability (CR), and average variance extracted (AVE) (Hair *et al.*, 2022). First, convergent validity and reliability were affirmed. As shown in Table 2, all items achieved loadings above the minimum threshold of 0.708 (Hair *et al.*, 2022), whereas rho_A and CR exceeded the minimum benchmark of 0.70 while AVE surpassed the minimum 0.50 threshold (Hair *et al.*, 2022). Second, discriminant validity was confirmed.

As reported in Table 3, Fornell and Larcker’s (1981) test shows that the square root of AVE for all constructs was higher than the correlations across all construct pairings. Moreover, the HTMT values for all constructs were below the 0.85 ceiling (Henseler et al., 2015). Overall, both discriminant validity tests were established and further confirmed by cross-loading results in Appendix Table A3.

Third, artificial autonomy and trust – were specified as Type 2 reflective-formative higher-order constructs and assessed using the procedures outlined by Becker et al. (2023). In the initial step, global items for both artificial autonomy (i.e. Overall, the FRP technology can independently complete my payment transaction without human intervention.) and trust (i.e. Overall, I trust the use of face recognition payment.) were developed and assessed. The redundancy analysis result achieved a path coefficient value of 0.871 and 0.850, which are above the minimum threshold of 0.70 (Hair et al., 2022), confirming convergent validity. The VIF results were found below the maximum threshold of 3.3 (Table 4), signifying that the dimensions were distinct. In the final step, the statistical significance of both dimensions of trust was confirmed ($p < 0.01$) (Table 4). Thus, convergent and discriminant validity were established.

Construct	1	2	3	4	5	6	7	8	9
1. Action autonomy (AA) (T1)	0.895	0.622	0.614	0.447	0.558	0.494	0.454	0.517	0.521
2. Sensing autonomy (SA) (T1)	0.689	0.864	0.598	0.508	0.574	0.550	0.535	0.557	0.544
3. Thought autonomy (TA) (T1)	0.682	0.674	0.863	0.497	0.567	0.587	0.497	0.572	0.520
4. Perceived technology security (PTS) (T1)	0.480	0.554	0.543	0.928	0.535	0.672	0.783	0.782	0.733
5. Perceived service enhancement (PSE) (T2)	0.619	0.647	0.641	0.582	0.821	0.578	0.579	0.627	0.621
6. Trust: Cognitive trust (CT) (T2)	0.550	0.622	0.665	0.735	0.655	0.898	0.703	0.688	0.573
7. Trust: Emotional trust (ET) (T2)	0.495	0.594	0.552	0.844	0.644	0.782	0.924	0.791	0.708
8. Subjective well-being (SWB) (T2)	0.561	0.613	0.630	0.841	0.690	0.761	0.842	0.907	0.789
9. Continuance use intention (CUI) (T3)	0.562	0.597	0.570	0.777	0.680	0.630	0.764	0.843	0.919

Table 3.
Assessment of
discriminant validity

Note(s): The HTMT (<0.85) result falls below the diagonal value; Values that are in italic represent the result of the square root of the AVE values, while the above result belongs to inter-construct correlations
Source(s): Authors’ own illustration

Higher-order construct	Lower-order construct	VIF	Weights	t-value	Convergent validity
Artificial autonomy (T1)	Action autonomy (AA) (T1)	1.917	0.259	4.228**	0.871
	Sensing autonomy (SA) (T1)	1.856	0.471	6.709**	
	Thought autonomy (TA) (T1)	1.829	0.428	7.693**	
Trust (T2)	Trust: Cognitive trust (CT) (T2)	1.976	0.387	7.547**	0.850
	Trust: Emotional trust (ET) (T2)	1.976	0.690	15.094**	

Table 4.
Assessment of high-
order construct

Note(s): T1 = Time 1. T2 = Time 2. VIF = Variance inflation factor. ** = $p < 0.01$
Source(s): Authors’ own illustration

5.3 Structural model evaluation

As part of the structural model evaluation, collinearity was unlikely to be an issue because the VIF values were lower than the maximum threshold of 3.33 (Hair *et al.*, 2022). Since time-lagged data (i.e. Time 1 to Time 3) was used in our study, the Durbin–Watson (D-W) test was employed to identify the occurrence of autocorrelation in our dataset (Watson and Durbin, 1951). As presented in Table 5, no autocorrelation was detected as the D-W value fell within the range of 1.903–1.931 (nearing 2.0). Additionally, the direct relationship results revealed that artificial autonomy was found to have significant influences on perceived service enhancement (H1a: $\beta = 0.657$, $t = 26.010$; $p < 0.01$) and trust (H1b: $\beta = 0.648$, $t = 27.023$; $p < 0.01$). Thus, H1a and H1b were supported with an explanatory power of 43.1 and 42.0%.

Furthermore, both perceived service enhancement (H2a: $\beta = 0.197$, $t = 6.561$; $p < 0.01$, $f^2 = 0.375$) and trust (H3a: $\beta = 0.689$, $t = 25.541$; $p < 0.01$, $f^2 = 0.614$) were found to have significant influences on subjective well-being with a large effect size. Thus, H2a and H3a were supported and these relationships explained 68.3% of the variance in subjective well-being. Moreover, this study also found that perceived service enhancement (H2b: $\beta = 0.172$, $t = 4.765$; $p < 0.01$, $f^2 = 0.041$), trust (H3b: $\beta = 0.116$, $t = 2.445$; $p < 0.01$, $f^2 = 0.023$), and subjective well-being (H4: $\beta = 0.599$, $t = 11.280$; $p < 0.01$, $f^2 = 0.345$) exhibited positive and significant effects on continuance use intention, especially after controlling the effects of age, gender, education level, marital status, prior experience of using FRP, which were not significant. It was also noted that subjective well-being produced a large effect on continuance use intention compared to the small effect sizes of both perceived service enhancement and trust. Overall, these relationships explained 67.0% of the variance in continuance use intention and provided significant support to H2b, H3b and H4.

Next, PLSpredict was used to assess the predictive relevance of the structural model. The Q^2_{predict} values for perceived service enhancement (0.424), trust (0.413), subjective well-being (0.403), and continuance use intention (0.367) were greater than zero (Table 5), demonstrating the predictive relevance of the model (Shmueli *et al.*, 2019). Subsequently, we looked at more precise prediction findings to focus on the endogenous items (Shmueli *et al.*, 2019). Table 6 indicates that all endogenous items of the key target endogenous construct, by means of continuance use intention, possessed strong predictive power. In particular, the Q^2_{predict} values for the indicators of the Partial Least Squares (PLS) model outperformed those generated for the linear model (LM) (Q^2 values > 0), while all root mean squared error (RMSE) values for the PLS model were smaller than those of the LM model (Shmueli *et al.*, 2019). To corroborate the result from PLSpredict, this study assessed the cross-validated predictive ability test (CVPAT) that offers a more comprehensive inferential test for the predictive model in predicting all endogenous items and constructs simultaneously (Sharma *et al.*, 2023). Based on Table 6, our proposed model has stronger predictive power than indicator average and linear model benchmarks. Therefore, it was established that the proposed model has a strong predictive ability to represent a new observation of the target population.

5.4 Sequential mediation evaluation

To assess the sequential mediating effects, we used the bootstrapping approach suggested by Hayes (2022). Based on Table 5, perceived service enhancement and subjective well-being sequentially mediate the relationship between artificial autonomy and continuance use intention (H5: $\beta = 0.078$, $t = 5.506$; $p < 0.01$). While trust and subjective well-being sequentially mediate the relationship between artificial autonomy and continuance use intention (H6: $\beta = 0.267$, $t = 10.113$; $p < 0.01$). Taken collectively, the results signal that the sequential mediators of trust and subjective well-being were statistically significant and played a stronger role than that of perceived service enhancement and subjective well-being (in terms of β) in promoting the relationship of artificial autonomy on continuance use intention of FRP (Table 5).

Relationship	Std. β	Std. Error	<i>t</i> -value	95% and 97.5% BCa CI		VIF	<i>f</i> ²	<i>R</i> ²	Q ² predict	Durbin– Watson
				LB	UB					
<i>Direct effect</i>										
H1a: Artificial autonomy (T1) → PSE (T2)	0.657	0.025	26.010**	0.611	0.694	1.000	NA	0.431	0.424	1.922
H1b: Artificial autonomy (T1) → Trust (T2)	0.648	0.024	27.023**	0.605	0.684	1.000	NA	0.420	0.413	1.903
H2a: PSE (T2) → SWB (T2)	0.197	0.030	6.561**	0.147	0.246	1.635	0.375	0.683	0.403	1.931
H2b: PSE (T2) → CUI (T3)	0.172	0.036	4.765**	0.117	0.237	1.758	0.041	0.670	0.367	1.921
H3a: Trust (T2) → SWB (T2)	0.689	0.027	25.541**	0.643	0.733	1.635	0.614			
H3b: Trust (T2) → CUI (T3)	0.116	0.048	2.445**	0.037	0.193	3.129	0.023			
H4: SWB (T2) → CUI (T3)	0.599	0.053	11.280**	0.513	0.687	3.151	0.345			
<i>Control variable</i>										
Age → CUI (T3)	0.093	0.146	0.633	−0.163	0.408					
Gender → CUI (T3)	0.070	0.056	1.265	−0.030	0.188					
Education level → CUI (T3)	0.028	0.034	0.815	−0.025	0.098					
Marital status → CUI (T3)	0.024	0.083	0.290	−0.113	0.160					
Prior experience of using facial recognition technology → CUI (T3)	0.062	0.053	1.167	−0.033	0.096					
<i>Sequential mediation effect</i>										
H5: Artificial autonomy (T1) → PSE (T2) → SWB (T2) → CUI (T3)	0.078	0.014	5.506**	0.053	0.108					
H6: Artificial autonomy (T1) → Trust (T2) → SWB (T2) → CUI (T3)	0.267	0.026	10.113**	0.216	0.322					

Table 5.
Assessment of
structural model

Note(s): PSE = Perceived service enhancement. SWB = Subjective well-being. CUI = Continuance use intention. ** = *p* < 0.01. T1 = Time 1. T2 = Time 2. T3 = Time 3. BCa CI = Bias corrected accelerated confidence interval. 95% BCa CI is used for direct effect estimation and 97.5% BCa CI is used for sequential mediation estimation. LB = Lower bound. UB = Upper bound. VIF = Variance inflation factor. NA = Not applicable

Source(s): Authors' own illustration

Assessment	Item	PLS RMSE	LM RMSE	PLS-LM RMSE	Q ² _predict	Decision of predictive power
PLSpredict	CUI1	1.188	1.192	−0.004	0.326	Strong
	CUI2	1.181	1.185	−0.004	0.304	
	CUI3	1.216	1.219	−0.003	0.313	
	CUI4	1.220	1.226	−0.006	0.294	

Assessment	Focus on PSE, trust, SWB, and CUI	PLS-SEM loss (M1)	Benchmark loss (M2)	Difference (M1-M2)	p-value	Decision of predictive power
CVPAT	CVPAT benchmark indicator average (IA) construct	0.595	1.006	−0.411	0.000	Strong
	CVPAT benchmark linear model (LM) construct	0.595	0.602	−0.007	0.001	

Note(s): CUI = Continuance use intention. CVPAT = Cross-validated predictive ability test. PLS = Partial least square. PLS SEM = PLS structural equation modelling. RMSE = Root mean square error. Q² = Predictive relevance

Source(s): Authors' own illustration

Table 6.
Assessment of
predictive power

5.5 Moderated mediation evaluation

We embarked on the moderated mediation procedure using PLS-SEM estimation (Cheah *et al.*, 2021) to examine whether perceived technology security strengthened or weakened the sequential mediating effects of artificial autonomy on continuance use intention. As indicated in Table 7, the moderated mediation index supports both H7 and H8, as the *p*-value is below 0.05 and the confidence interval excludes zero.

Hypothesis	Conditional mediation effect	Std. β	Std. Error	<i>t</i> -value	<i>p</i> -value	95% BCa CI	
H7. Artificial autonomy → PSE → SWB → CUI	Index of moderated mediation	0.013	0.004	2.861	0.002	0.006	0.021
	Perceived technology security (Moderator)						
	Low	0.053	0.019	2.778	0.003	0.020	0.081
	Medium	0.058	0.021	2.703	0.003	0.025	0.092
H8. Artificial autonomy → TRS → SWB → CUI	Index of moderated mediation	0.062	0.031	2.000	0.023	0.011	0.108
	Perceived technology security (Moderator)	0.021	0.010	2.117	0.017	0.006	0.039
	Low	0.145	0.036	4.017	0.000	0.017	0.280
	Medium	0.153	0.034	4.498	0.000	0.063	0.299
	High	0.161	0.035	4.608	0.000	0.130	0.323

Note(s): AA = Artificial autonomy. PSE = Perceived service enhancement. TRS = Trust. SWB = Subjective well-being. CUI = Continuance use intention. BCa CI = Bias corrected accelerated confidence interval. LB = Lower bound. UB = Upper bound

Source(s): Authors' own illustration

Table 7.
Assessment of the
moderated mediation

Exploring these effects further, the standardised beta values of the moderated sequential mediation effect for perceived service enhancement and subjective well-being as well as trust and subjective well-being escalate from low to high perceived technology security levels. For H7 and H8, both ends of confidence intervals remain positive, signifying the significance of perceived technology security effects across all levels: low, medium, and high. These findings highlight the importance of considering varying levels of perceived technology security when contemplating the sequential mediation effect of perceived service enhancement and subjective well-being as well as trust and subjective well-being in enhancing the relationship between artificial autonomy and continuance use intention of FRP.

6. Discussion

This study aimed to expand the theoretical applicability of SDT, ECM, and PMT to the post-adoption behaviour of FRP. In doing so, the study presented new evidence on the impact of artificial autonomy on perceived service enhancement and trust towards FRP. Importantly, the continued use intention of FRP is positively influenced by three key factors: perceived service enhancement, trust, and subjective well-being. These findings are consistent with conclusions drawn in the post-adoption literature on mobile payments. Our results also indicate that perceived service enhancement, trust, and subjective well-being collectively serve as important sequential mediators in explaining the relationship between artificial autonomy and continuance use intention of FRP. This understanding is further enhanced through the identification of conditional mediation effects. Specifically, FRP features prove effective in generating positive outcomes (i.e. perceived service enhancement, subjective well-being, and trust) on continuance use intention, but only when perceived technology security of FRP is high. Hence, this study contributes significantly as it is the first to comprehensively explore the roles of sequential mediators and the moderator in FRP, grounded in the integrated theoretical frameworks of SDT, ECM, and PMT. Consequently, this study provides numerous theoretical and practical contributions, which will be discussed in the following sections.

6.1 Theoretical implications

This study contributes significantly to existing knowledge in several ways. Firstly, the study expands the theoretical applicability of SDT by elucidating the crucial role of autonomous motivation in heightening users' expectations regarding the adoption of a new payment system. While the concept and function of artificial autonomy have garnered attention with the incorporation of autonomy features in AI artifacts like FRP, its substantial impact on predicting user experiences under such circumstances remains underexplored. Building on the recommendations of Hu *et al.* (2021), our study evidence that the artificial autonomy of FRP, associated with three task primitives – action, sensing, and thought – is a key factor in enhancing users' expectations. As anticipated, users have expressed positive expectations, particularly in perceived service enhancement and trust, when using FRP, which operates with high autonomy and intelligence (H1a and H1b supported). These findings align with the conclusions of Hu *et al.* (2021), affirming that artificial autonomy is a fundamental feature that reflects the AI device's ability to perform tasks effectively without human assistance, thereby providing users with an extraordinary experience.

Secondly, this study addresses an important theoretical question in the literature by providing evidence on the “what” and the “how” of the underlying mechanisms predicting continuance use intention through three stages (i.e. expectation, confirmation, and post-adoption behaviour) as outlined in ECM. From the direct relationship findings, we confirmed the importance of both perceived service enhancement and trust in influencing users' subjective well-being (H2a and H3a supported). This implies that users would only experience

a high level of subjective well-being when they perceive that FRP is reliable and provides excellent service as compared to conventional payment systems. These results are consistent with previous studies, which reported that an efficient and capable mobile banking system that provides accurate services helps to enhance the quality of life of users, while a low-risk platform increases user subjective well-being (Chakraborty *et al.*, 2022; Geebren *et al.*, 2021). Apart from this, our study has shown that perceived service enhancement, trust, and subjective well-being are three vital factors influencing users' post-adoption (i.e. continuance use intention) with FRP (H2b, H3b, and H4 were supported). These results suggest that users' final decisions to continue or discontinue the use of the innovation are subject to the benefits they obtained (Lim, 2018; Javornik *et al.*, 2022).

Thirdly, by pinpointing two sets of sequential mediation roles of perceived service enhancement and subjective well-being as well as trust and subjective well-being in the relationships between artificial autonomy and continuance use intention (H5 and H6 supported), this study contributes to the scarce literature on FRP and the theoretical generalisability of ECM in a new context. This contribution echoes the view of IS studies by opening the black box on how artificial autonomy influences post-adoption behaviour (Li *et al.*, 2022b), thereby enriching our understanding of the necessary conditions for creating a strong linkage between FRP features and desirable results.

Lastly, the study's most noteworthy contribution arguably lies in the conditional factor of perceived technology security, which moderates the sequential mediators in the use of FRP (H7 and H8 supported). In doing so, we provide a more nuanced understanding that the relative contributions of artificial autonomy in promoting continued use (through a combined effect of perceived service enhancement, trust, and subjective well-being) depend on users' perceived technology security when interacting with FRP. In simpler terms, the findings highlight a crucial insight for future research: the provision of a payment system with high autonomy is more effective in enhancing users' perceptions of service delivery, trust, and well-being, subsequently on continuance use when they perceive a higher level of security during usage. This is in line with the fundamental principle of PMT (Rogers, 1983) and previous findings suggesting that although many users have a favourable attitude towards innovations, a significant number are reluctant to use them regularly due to security concerns (Nguyen *et al.*, 2021; Zhong *et al.*, 2021). Consequently, these findings provide a plausible explanation for why FRP continues to grapple with unresolved security issues, despite its design intent to provide enhanced benefits in everyday transactions (Liu *et al.*, 2021).

6.2 Practical implications

With the growing maturity of FRP, service providers must identify the essential factors that are relevant and optimise the usage among existing users. Service providers should recognise the prominent effect of artificial autonomy to raise service quality and enhance user beliefs cognitively and emotionally. In the context of FRP, artificial autonomy can be distinguished by three autonomous features: action, sense, and thought. Sensing autonomy can be improved by updating the system promptly to ensure that FRP can accurately recognise user facial expressions without manually entering relative information. Since FRP technology uses both AI and deep learning algorithms to classify data, thought autonomy can be improved by ensuring that the system can provide users with reliable and responsive recommendations without human intervention. It is also crucial that service providers always improve algorithms to increase the action autonomy of FRP (e.g. processing biometric data with fewer errors to entice users to continue using the technology). All of these are critical considerations to assemble a comprehensive artificial autonomy for FRP, because the use of FRP involves monetary transactions, and thus, any transaction error would result in a loss of user confidence and damage to the reputation of service providers.

Our findings also imply that service providers need to improve service performance as well as engender users' trust and subjective well-being to facilitate post-adoption usage of FRP. Strategies that can be implemented to provide FRP users with a smooth and compelling experience, for instance, is to ensure that the payment process is fun, efficient, and effortless. This will encourage users to believe in the ability and responsiveness of FRP, thereby encouraging them to continue using that technology.

Moreover, service providers should also pay close attention to both cognitive and emotional trust when driving desirable responses. The findings have shown that, in addition to providing a well-designed interface, it is also important that service providers try to meet the needs of users, for instance, ensuring that they interact with FRP in comfortable and satisfactory ways. Improving various aspects of human functioning, such as positive emotions, happiness, and making lives easier, is another aspect that should not be neglected to ensure the continued usage of FRP. Service providers are encouraged to use videos to illustrate the benefits of using FRP for both new and existing users. For example, they can show in their promotional videos how these payment options facilitate the creation of a healthier and safer shopping environment, streamline operations, and optimise sales opportunities, especially during pandemics like COVID-19.

Lastly, service providers must enhance user security control and alleviate concerns about security risks in the payment process using FRP. To achieve this, providers should provide additional levels of security options, such as incorporating the ability to enter a password in the payment interface. To prevent users and visitors from abandoning FRP due to security concerns, it is recommended to implement an isolated screen baffle to safeguard personal data. Additionally, it is essential to deploy FRP in highly controlled environments and regularly upgrade them with corresponding risk control systems (Piper, 2019). Government agencies are responsible for designing effective strategies and policies to safeguard user personal data from unauthorised access and illicit use. Collaborative efforts between government agencies and service providers are crucial to educate users and visitors about the robust security systems underpinning FRP, thereby mitigating potential concerns or resistance.

7. Conclusion

7.1 Key takeaways

This study provides new insights by examining how artificial autonomy in FRP can affect several facets of user perceptions and behavioural decisions. Supported by SDT, ECM, and PMT, the results showed that users who experience high artificial autonomy (or autonomous motivation) when using FRP have a greater ability to navigate perceived service enhancement, trust, and subjective well-being that contribute to continuance use intention of FRP. The study also deepened our understanding that FRP with strong perceived technology security can strengthen the sequential mediation relationships (perceived service enhancement and subjective well-being; trust and subjective well-being) between artificial autonomy and continuance use intention. For researchers, this study provides a basis for further understanding the post-adoption behaviour of FRP using SDT, ECM, and PMT. Providing powerful artificial autonomy in FRP should enhance user service experiences, build trust, and generate positive outcomes that improve their standard of living. Finally, to increase the desire for continuance use, FRP must become a versatile and secure option for users when making any kind of payment.

7.2 Limitations and future research directions

Notwithstanding the significant theoretical and practical implications of this study, several limitations exist, which may pave the way for future research. Firstly, our study sheds light on

people's perceptions and behaviours toward FRP, especially those who attended the Beijing 2022 Winter Olympics, a majority being athletes aged 18–35 years. This specific demographic makes it challenging to extrapolate findings to different contexts like banks (Nguyen *et al.*, 2021), smart retail stores (Moriuchi, 2021), or other mega-events (e.g. Coachella Valley Music and Arts Festival, Paris 2024 Summer Olympics, world expositions). Thus, future research should investigate various FRP scenarios, both physical and virtual, to enhance our model's robustness and generalisability. This is pivotal for elevating operational efficiency and risk management in today's digital age. Secondly, while we accounted for many relevant variables, the findings might still be enhanced by some unexplored moderators. Future research can incorporate both prevention and promotion perspectives to delve into the conditional mediation model (Lim *et al.*, 2021). Such factors may shape the interplay between artificial autonomy's effects and continuance use decision-making. Lastly, as the "metaverse" gains traction globally (Kraus *et al.*, 2023), Meta Pay, a metaverse-based payment system, emerges as a potential payment frontier that allows users to preload virtual debit cards with unlimited cryptocurrencies (Kumar *et al.*, 2024). Exploring user acceptance or intent towards innovative payment systems like Meta Pay will be a valuable avenue for upcoming research.

References

- ABI Research (2020), "Up to 2.5 million biometric payment cards to be issued in 2021 as second-generation architectures hit the market", available at: <https://www.abiresearch.com/press/25-million-biometric-payment-cards-be-issued-2021-second-generation-architectures-hit-market/> (accessed 15 May 2023).
- Aboelmaged, M., Hashem, G. and Mouakket, S. (2021), "Predicting subjective well-being among mHealth users: a readiness–value model", *International Journal of Information Management*, Vol. 56, 102247, doi: [10.1016/j.ijinfomgt.2020.102247](https://doi.org/10.1016/j.ijinfomgt.2020.102247).
- Al-Balushi, A., Tarhini, A., Acikgoz, F. and Ali, S. (2024), "Examining the factors that influence user information security behavior toward COVID-19 scams", *International Journal of Human–Computer Interaction*, doi: [10.1080/10447318.2023.2291608](https://doi.org/10.1080/10447318.2023.2291608).
- Al-Maliki, O. and Al-Assam, H. (2021), "Challenge-response mutual authentication protocol for EMV contactless cards", *Computers and Security*, Vol. 103, 102186, doi: [10.1016/j.cose.2021.102186](https://doi.org/10.1016/j.cose.2021.102186).
- Alalwan, A.A., Baabdullah, A.M., Al-Debei, M.M., Raman, R., Alhitmi, H.K., Abu-ElSamen, A.A. and Dwivedi, Y.K. (2024), "Fintech and contactless payment: help or hindrance? The role of invasion of privacy and information disclosure", *International Journal of Bank Marketing*, Vol. 42 No. 1, pp. 66–93, doi: [10.1108/ijbm-08-2022-0339](https://doi.org/10.1108/ijbm-08-2022-0339).
- Arghashi, V. and Yuksel, C.A. (2022), "Interactivity, inspiration, and perceived usefulness! How retailers' AR-apps improve consumer engagement through flow", *Journal of Retailing and Consumer Services*, Vol. 64, 102756, doi: [10.1016/j.jretconser.2021.102756](https://doi.org/10.1016/j.jretconser.2021.102756).
- Arpaci, I. (2023), "Predictors of financial sustainability for cryptocurrencies: an empirical study using a hybrid SEM-ANN approach", *Technological Forecasting and Social Change*, Vol. 196, 122858, doi: [10.1016/j.techfore.2023.122858](https://doi.org/10.1016/j.techfore.2023.122858).
- Ashraf, A.R., Tek, N.T., Anwar, A., Lapa, L. and Venkatesh, V. (2021), "Perceived values and motivations influencing m-commerce use: a nine-country comparative study", *International Journal of Information Management*, Vol. 59, 102318, doi: [10.1016/j.ijinfomgt.2021.102318](https://doi.org/10.1016/j.ijinfomgt.2021.102318).
- Becker, J.M., Cheah, J.H., Gholamzade, R., Ringle, C.M. and Sarstedt, M. (2023), "PLS-SEM's most wanted guidance", *International Journal of Contemporary Hospitality Management*, Vol. 35 No. 1, pp. 321–346, doi: [10.1108/ijchm-04-2022-0474](https://doi.org/10.1108/ijchm-04-2022-0474).
- Belanche, D., Casaló, L.V. and Flavián, C. (2021), "Frontline robots in tourism and hospitality: service enhancement or cost reduction?", *Electronic Markets*, Vol. 31 No. 3, pp. 477–492, doi: [10.1007/s12525-020-00432-5](https://doi.org/10.1007/s12525-020-00432-5).

- Bhatia, S., Singh, N. and Liebana-Cabanillas, F. (2023), "Intermittent continued adoption of digital payment services during the COVID-19 induced pandemic", *International Journal of Human-Computer Interaction*, Vol. 39 No. 14, pp. 2905-2919, doi: [10.1080/10447318.2022.2087671](https://doi.org/10.1080/10447318.2022.2087671).
- Bhattacharjee, A. (2001), "Understanding information systems continuance: an expectation-confirmation model", *MIS Quarterly*, Vol. 25 No. 3, pp. 351-370, doi: [10.2307/3250921](https://doi.org/10.2307/3250921).
- Buzinde, C.N. (2020), "Theoretical linkages between well-being and tourism: the case of self-determination theory and spiritual tourism", *Annals of Tourism Research*, Vol. 83, pp. 1-11, doi: [10.1016/j.annals.2020.102920](https://doi.org/10.1016/j.annals.2020.102920).
- Cassia, F. and Magno, F. (2024), "The value of self-determination theory in marketing studies: insights from the application of PLS-SEM and NCA to anti-food waste apps", *Journal of Business Research*, Vol. 172, 114454, doi: [10.1016/j.jbusres.2023.114454](https://doi.org/10.1016/j.jbusres.2023.114454).
- Chakraborty, D., Siddiqui, A., Siddiqui, M., Rana, N.P. and Dash, G. (2022), "Mobile payment apps filling value gaps: integrating consumption values with initial trust and customer involvement", *Journal of Retailing and Consumer Services*, Vol. 66, 102946, doi: [10.1016/j.jretconser.2022.102946](https://doi.org/10.1016/j.jretconser.2022.102946).
- Chang, W.L., Chen, L.M. and Hashimoto, T. (2022a), "Cashless Japan: unlocking influential risk on mobile payment service", *Information Systems Frontiers*, Vol. 24 No. 5, pp. 1515-1528, doi: [10.1007/s10796-021-10160-6](https://doi.org/10.1007/s10796-021-10160-6).
- Chang, Y.S., Cheah, J.H., Lim, X.J., Morrison, A.M. and Kennell, J.S. (2022b), "Are unmanned smart hotels du jour or are they here forever? Experiential pathway analysis of antecedents of satisfaction and loyalty", *International Journal of Hospitality Management*, Vol. 104, 103249, doi: [10.1016/j.ijhm.2022.103249](https://doi.org/10.1016/j.ijhm.2022.103249).
- Cheah, J.H., Nitzl, C., Roldán, J.L., Cepeda-Carrion, G. and Gudergan, S.P. (2021), "A primer on the conditional mediation analysis in PLS-SEM", *ACM SIGMIS Database: The DATABASE for Advances in Information Systems*, Vol. 52 SI, pp. 43-100, doi: [10.1145/3505639.3505645](https://doi.org/10.1145/3505639.3505645).
- Cheah (Jacky), J.-H., Magno, F. and Cassia, F. (2024), "Reviewing the SmartPLS 4 software: the latest features and enhancements", *Journal of Marketing Analytics*, Vol. 12 No. 1, pp. 97-107, doi: [10.1057/s41270-023-00266-y](https://doi.org/10.1057/s41270-023-00266-y).
- Chennamaneni, A. and Gupta, B. (2023), "The privacy protection behaviours of the mobile app users: exploring the role of neuroticism and protection motivation theory", *Behaviour and Information Technology*, Vol. 42 No. 12, pp. 2011-2029, doi: [10.1080/0144929x.2022.2106307](https://doi.org/10.1080/0144929x.2022.2106307).
- Chin, W.W. (1998), "The partial least squares approach to structural equation modelling", in Marcoulides, G.A. (Ed.), *Modern Methods for Business Research*, Erlbaum, Mahwah, NJ, pp. 295-358.
- Chin, W.W., Thatcher, J.B. and Wright, R.T. (2012), "Assessing common method bias: problems with the ULMC technique", *MIS Quarterly*, Vol. 36 No. 3, pp. 1003-1019, doi: [10.2307/41703491](https://doi.org/10.2307/41703491).
- Ciftci, O., Choi, E.K.C. and Berezina, K. (2021), "Let's face it: are customers ready for facial recognition technology at quick-service restaurants?", *International Journal of Hospitality Management*, Vol. 95, 102941, doi: [10.1016/j.ijhm.2021.102941](https://doi.org/10.1016/j.ijhm.2021.102941).
- Davis, F.D., Bagozzi, R.P. and Warshaw, P.R. (1992), "Extrinsic and intrinsic motivation to use computers in the workplace", *Journal of Applied Social Psychology*, Vol. 22 No. 14, pp. 1111-1132, doi: [10.1111/j.1559-1816.1992.tb00945.x](https://doi.org/10.1111/j.1559-1816.1992.tb00945.x).
- de Luna, I.R., Liébana-Cabanillas, F., Sánchez-Fernández, J. and Muñoz-Leiva, F. (2019), "Mobile payment is not all the same: the adoption of mobile payment systems depending on the technology applied", *Technological Forecasting and Social Change*, Vol. 146, pp. 931-944, doi: [10.1016/j.techfore.2018.09.018](https://doi.org/10.1016/j.techfore.2018.09.018).
- Diener, E. (1984), "Subjective well-being", *Psychological Bulletin*, Vol. 95 No. 3, pp. 542-575, doi: [10.1037//0033-2909.95.3.542](https://doi.org/10.1037//0033-2909.95.3.542).
- Duan, S.X. and Deng, H. (2022), "Exploring privacy paradox in contact tracing apps adoption", *Internet Research*, Vol. 32 No. 5, pp. 1725-1750, doi: [10.1108/intr-03-2021-0160](https://doi.org/10.1108/intr-03-2021-0160).

- Fang, Y.H., Li, C.Y., Arain, G.A. and Bhatti, Z.A. (2021), "How does participation and browsing affect continuance intention in virtual communities? An integration of curiosity theory and subjective well-being", *Behaviour and Information Technology*, Vol. 40 No. 3, pp. 221-239, doi: [10.1080/0144929x.2019.1685002](https://doi.org/10.1080/0144929x.2019.1685002).
- Formosa, P. (2021), "Robot autonomy vs human autonomy: social robots, artificial intelligence (AI), and the nature of autonomy", *Minds and Machines*, Vol. 31 No. 4, pp. 595-616, doi: [10.1007/s11023-021-09579-2](https://doi.org/10.1007/s11023-021-09579-2).
- Fornell, C. and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18 No. 1, pp. 39-50, doi: [10.2307/3151312](https://doi.org/10.2307/3151312).
- Franque, F.B., Oliveira, T. and Tam, C. (2023), "Continuance intention of mobile payment: TTF model with trust in an African context", *Information Systems Frontiers*, Vol. 25 No. 2, pp. 775-793, doi: [10.1007/s10796-022-10263-8](https://doi.org/10.1007/s10796-022-10263-8).
- Geebren, A., Jabbar, A. and Luo, M. (2021), "Examining the role of consumer satisfaction within mobile eco-systems: evidence from mobile banking services", *Computers in Human Behavior*, Vol. 114, 106584, doi: [10.1016/j.chb.2020.106584](https://doi.org/10.1016/j.chb.2020.106584).
- Gupta, A., Yousaf, A. and Mishra, A. (2020), "How pre-adoption expectancies shape post-adoption continuance intentions: an extended expectation-confirmation model", *International Journal of Information Management*, Vol. 52, 102094, doi: [10.1016/j.ijinfomgt.2020.102094](https://doi.org/10.1016/j.ijinfomgt.2020.102094).
- Gupta, S., Modgil, S., Lee, C.K. and Sivarajah, U. (2023), "The future is yesterday: use of AI-driven facial recognition to enhance value in the travel and tourism industry", *Information Systems Frontiers*, Vol. 25 No. 3, pp. 1179-1195, doi: [10.1007/s10796-022-10271-8](https://doi.org/10.1007/s10796-022-10271-8).
- Gursoy, D., Chi, O.H., Lu, L. and Nunkoo, R. (2019), "Consumers acceptance of artificially intelligent (AI) device use in service delivery", *International Journal of Information Management*, Vol. 49, pp. 157-169, doi: [10.1016/j.ijinfomgt.2019.03.008](https://doi.org/10.1016/j.ijinfomgt.2019.03.008).
- Hair, J.F.J., Hult, G.T.M., Ringle, C.M. and Sarstedt, M. (2022), *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, 3rd ed., SAGE Publications, Thousand Oaks, CA.
- Hayes, A.F. (2022), *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*, 3rd ed., The Guilford Press, New York.
- Henkens, B., Verleye, K. and Larivière, B. (2021), "The smarter, the better?! Customer well-being, engagement, and perceptions in smart service systems", *International Journal of Research in Marketing*, Vol. 38 No. 2, pp. 425-447, doi: [10.1016/j.ijresmar.2020.09.006](https://doi.org/10.1016/j.ijresmar.2020.09.006).
- Henseler, J., Ringle, C.M. and Sarstedt, M. (2015), "A new criterion for assessing discriminant validity in variance-based structural equation modelling", *Journal of the Academy of Marketing Science*, Vol. 43 No. 1, pp. 115-135, doi: [10.1007/s11747-014-0403-8](https://doi.org/10.1007/s11747-014-0403-8).
- Hijazi, R. and Abudaabes, A. (2023), "PMT and mobile payment continuance intention: the moderating influence of digitalization anxiety", *Conference on Sustainability and Cutting-Edge Business Technologies*, Cham, Springer Nature, pp. 380-395.
- Hsu, H.Y., Liu, F.H., Tsou, H.T. and Chen, L.J. (2018), "Openness of technology adoption, top management support and service innovation: a social innovation perspective", *Journal of Business and Industrial Marketing*, Vol. 34 No. 3, pp. 575-590, doi: [10.1108/jbim-03-2017-0068](https://doi.org/10.1108/jbim-03-2017-0068).
- Hu, Q., Lu, Y., Pan, Z., Gong, Y. and Yang, Z. (2021), "Can AI artifacts influence human cognition? The effects of artificial autonomy in intelligent personal assistants", *International Journal of Information Management*, Vol. 56, 102250, doi: [10.1016/j.ijinfomgt.2020.102250](https://doi.org/10.1016/j.ijinfomgt.2020.102250).
- iiMedia Research (2019), "Special research report on the social value of the application of face-scanning payment technology in China", available at: <https://www.iimedia.cn/c400/66866.html> (assessed 12 July 2023).
- Jan, I.U., Ji, S. and Kim, C. (2023), "What (de) motivates customers to use AI-powered conversational agents for shopping? The extended behavioral reasoning perspective", *Journal of Retailing and Consumer Services*, Vol. 75, 103440, doi: [10.1016/j.jretconser.2023.103440](https://doi.org/10.1016/j.jretconser.2023.103440).

- Jao, N. (2019), "State-backed UnionPay announces new facial recognition payment feature", available at: <https://technode.com/2019/10/21/state-backed-unionpay-announces-new-facial-recognition-payment-feature> (assessed 10 July 2023).
- Javornik, A., Marder, B., Barhorst, J.B., McLean, G., Rogers, Y., Marshall, P. and Warlop, L. (2022), "What lies behind the filter? Uncovering the motivations for using augmented reality (AR) face filters on social media and their effect on well-being", *Computers in Human Behavior*, Vol. 128, 107126, doi: [10.1016/j.chb.2021.107126](https://doi.org/10.1016/j.chb.2021.107126).
- Johnson-George, C. and Swap, W.C. (1982), "Measurement of specific interpersonal trust: construction and validation of a scale to assess trust in a specific other", *Journal of Personality and Social Psychology*, Vol. 43 No. 6, pp. 1306-1317, doi: [10.1037/0022-3514.43.6.1306](https://doi.org/10.1037/0022-3514.43.6.1306).
- Kim, M.J. and Hall, C.M. (2019), "A hedonic motivation model in virtual reality tourism: comparing visitors and non-visitors", *International Journal of Information Management*, Vol. 46, pp. 236-249, doi: [10.1016/j.ijinfomgt.2018.11.016](https://doi.org/10.1016/j.ijinfomgt.2018.11.016).
- Kim, K.J. and Shin, D.H. (2015), "An acceptance model for smart watches: implications for the adoption of future wearable technology", *Internet Research*, Vol. 25 No. 4, pp. 527-541, doi: [10.1108/intr-05-2014-0126](https://doi.org/10.1108/intr-05-2014-0126).
- Kock, N. and Lynn, G. (2012), "Lateral collinearity and misleading results in variance-based SEM: an illustration and recommendations", *Journal of the Association for Information Systems*, Vol. 13 No. 7, pp. 546-580, doi: [10.17705/1jais.00302](https://doi.org/10.17705/1jais.00302).
- Kong, Q., Lu, R., Ma, M. and Bao, H. (2019), "A privacy-preserving sensory data sharing scheme in internet of vehicles", *Future Generation Computer Systems*, Vol. 92, pp. 644-655, doi: [10.1016/j.future.2017.12.003](https://doi.org/10.1016/j.future.2017.12.003).
- Köse, D.B., Morschheuser, B. and Hamari, J. (2019), "Is it a tool or a toy? How user's conception of a system's purpose affects their experience and use", *International Journal of Information Management*, Vol. 49, pp. 461-474, doi: [10.1016/j.ijinfomgt.2019.07.016](https://doi.org/10.1016/j.ijinfomgt.2019.07.016).
- Kraus, S., Kumar, S., Lim, W.M., Kaur, J., Sharma, A. and Schiavone, F. (2023), "From moon landing to metaverse: tracing the evolution of technological forecasting and social change", *Technological Forecasting and Social Change*, Vol. 189, 122381, doi: [10.1016/j.techfore.2023.122381](https://doi.org/10.1016/j.techfore.2023.122381).
- Kumar, S., Sureka, R., Lucey, B.M., Dowling, M., Vigne, S. and Lim, W.M. (2024), "MetaMoney: exploring the intersection of financial systems and virtual worlds", *Research in International Business and Finance*, Vol. 68, 102195, doi: [10.1016/j.ribaf.2023.102195](https://doi.org/10.1016/j.ribaf.2023.102195).
- Lacity, M.C., Schuetz, S.W., Kuai, L. and Steelman, Z.R. (2024), "IT's a matter of trust: literature reviews and analyses of human trust in information technology", *Journal of Information Technology*, doi: [10.1177/02683962231226397](https://doi.org/10.1177/02683962231226397).
- Lai, X. and Rau, P.L.P. (2021), "Has facial recognition technology been misused? A public perception model of facial recognition scenarios", *Computers in Human Behavior*, Vol. 124, 106894, doi: [10.1016/j.chb.2021.106894](https://doi.org/10.1016/j.chb.2021.106894).
- Lee, K.Y., Han, S., Shin, S.I. and Yang, S.B. (2023), "Investigating the net benefits of contactless technologies in quick-service restaurants: the moderating roles of social interaction anxiety and language proficiency", *Internet Research*, Vol. 33 No. 1, pp. 308-343, doi: [10.1108/intr-07-2021-0462](https://doi.org/10.1108/intr-07-2021-0462).
- Leong, L.Y., Hew, J.J., Wong, L.W. and Lin, B. (2022), "The past and beyond of mobile payment research: a development of the mobile payment framework", *Internet Research*, Vol. 32 No. 6, pp. 1757-1782, doi: [10.1108/intr-06-2021-0348](https://doi.org/10.1108/intr-06-2021-0348).
- Li, C., Li, H., Wang, P., Li, K., Li, X. and Zhang, Y. (2020), "Facial payment use in China: an integrated view of privacy concerns and perceived benefits", *Proceedings of the 2020 Pacific Asia Conference on Information Systems*, Vol. 9, pp. 68-76, doi: [10.1080/21623945.2020.1721692](https://doi.org/10.1080/21623945.2020.1721692).
- Li, L., Hsu, C., Mao, J.Y. and Zhang, W. (2022a), "Contextualising digital innovation in today's China: local practices and global contributions", *Information Systems Journal*, Vol. 32 No. 3, pp. 623-629, doi: [10.1111/isj.12379](https://doi.org/10.1111/isj.12379).

- Li, Y., Liu, R., Wang, J. and Zhao, T. (2022b), "How does mHealth service quality influences adoption?", *Industrial Management and Data Systems*, Vol. 122 No. 3, pp. 774-795, doi: [10.1108/imds-12-2020-0758](https://doi.org/10.1108/imds-12-2020-0758).
- Liébana-Cabanillas, F., Sánchez-Fernández, J. and Muñoz-Leiva, F. (2014), "Antecedents of the adoption of the new mobile payment systems: the moderating effect of age", *Computers in Human Behavior*, Vol. 35, pp. 464-478, doi: [10.1016/j.chb.2014.03.022](https://doi.org/10.1016/j.chb.2014.03.022).
- Lim, W.M. (2015), "Antecedents and consequences of e-shopping: an integrated model", *Internet Research*, Vol. 25 No. 2, pp. 184-217, doi: [10.1108/intr-11-2013-0247](https://doi.org/10.1108/intr-11-2013-0247).
- Lim, W.M. (2018), "Dialectic antidotes to critics of the technology acceptance model: conceptual, methodological, and replication treatments for behavioural modelling in technology-mediated environments", *Australasian Journal of Information Systems*, Vol. 22, doi: [10.3127/ajis.v22i0.1651](https://doi.org/10.3127/ajis.v22i0.1651).
- Lim, W.M. (2023), "Philosophy of science and research paradigm for business research in the transformative age of automation, digitalization, hyperconnectivity, obligations, globalization and sustainability", *Journal of Trade Science*, Vol. 11 Nos 2/3, pp. 3-30, doi: [10.1108/jts-07-2023-0015](https://doi.org/10.1108/jts-07-2023-0015).
- Lim, X.J., Cheah, J.H., Ng, S.I., Basha, N.K. and Soutar, G. (2021), "The effects of anthropomorphism presence and the marketing mix have on retail app continuance use intention", *Technological Forecasting and Social Change*, Vol. 168, 120763, doi: [10.1016/j.techfore.2021.120763](https://doi.org/10.1016/j.techfore.2021.120763).
- Lim, X.J., Ngew, P., Cheah, J.H., Cham, T.H. and Liu, Y. (2022), "Go digital: can the money-gift function promote the use of e-wallet apps?", *Internet Research*, Vol. 32 No. 6, pp. 1806-1831, doi: [10.1108/intr-06-2021-0406](https://doi.org/10.1108/intr-06-2021-0406).
- Lin, F.R. and Windasari, N.A. (2019), "Continued use of wearables for wellbeing with a cultural probe", *The Service Industries Journal*, Vol. 39 Nos 15-16, pp. 1140-1166, doi: [10.1080/02642069.2018.1504924](https://doi.org/10.1080/02642069.2018.1504924).
- LinkedIn (2021), "'Smile to pay' – facial recognition payment in China", available at: <https://www.linkedin.com/pulse/smile-pay-facial-recognition-payment-china-anne-rousselet/> (assessed 13 August 2023).
- Liu, F. (2019), "Face recognition technology: behind the Chinese public's worries", available at: <https://www.bbc.com/zhongwen/simp/chinese-news-50685535> (assessed 13 August 2023).
- Liu, Y.L., Yan, W. and Hu, B. (2021), "Resistance to facial recognition payment in China: the influence of privacy-related factors", *Telecommunications Policy*, Vol. 45 No. 5, 102155, doi: [10.1016/j.telpol.2021.102155](https://doi.org/10.1016/j.telpol.2021.102155).
- Lu, L., Cai, R. and Gursoy, D. (2019), "Developing and validating a service robot integration willingness scale", *International Journal of Hospitality Management*, Vol. 80, pp. 36-51, doi: [10.1016/j.ijhm.2019.01.005](https://doi.org/10.1016/j.ijhm.2019.01.005).
- MacKenzie, S.B. and Podsakoff, P.M. (2012), "Common method bias in marketing: causes, mechanisms, and procedural remedies", *Journal of Retailing*, Vol. 88 No. 4, pp. 542-555, doi: [10.1016/j.jretai.2012.08.001](https://doi.org/10.1016/j.jretai.2012.08.001).
- Maity, S., Abdel-Mottaleb, M. and Asfour, S.S. (2020), "Multimodal biometrics recognition from facial video with missing modalities using deep learning", *Journal of Information Processing Systems*, Vol. 16 No. 1, pp. 6-29.
- Medeiros, M., Ozturk, A., Hancer, M., Weinland, J. and Okumus, B. (2022), "Understanding travel tracking mobile application usage: an integration of self-determination theory and UTAUT2", *Tourism Management Perspectives*, Vol. 42, 100949, doi: [10.1016/j.tmp.2022.100949](https://doi.org/10.1016/j.tmp.2022.100949).
- Meng-Lewis, Y., Lewis, G., Lin, Z. and Zhao, Y. (2024), "Examination of esports fans' live streaming experiences using an extended expectation-confirmation model: a case study of the King Pro League", *International Journal of Human-Computer Interaction*, Vol. 40 No. 5, pp. 1282-1297, doi: [10.1080/10447318.2022.2141008](https://doi.org/10.1080/10447318.2022.2141008).

- Mishra, A., Shukla, A., Rana, N.P., Currie, W.L. and Dwivedi, Y.K. (2023), "Re-examining post-acceptance model of information systems continuance: a revised theoretical model using MASEM approach", *International Journal of Information Management*, Vol. 68, 102571, doi: [10.1016/j.ijinfomgt.2022.102571](https://doi.org/10.1016/j.ijinfomgt.2022.102571).
- Moriuchi, E. (2021), "An empirical study of consumers' intention to use biometric facial recognition as a payment method", *Psychology and Marketing*, Vol. 38 No. 10, pp. 1741-1765, doi: [10.1002/mar.21495](https://doi.org/10.1002/mar.21495).
- Müller, V.C. (2012), "Autonomous cognitive systems in real-world environments: less control, more flexibility and better interaction", *Cognitive Computation*, Vol. 4 No. 3, pp. 212-215, doi: [10.1007/s12559-012-9129-4](https://doi.org/10.1007/s12559-012-9129-4).
- Nguyen, N., Nguyen, H.V., Nguyen, H., Tran, V.T. and Nguyen, T.H. (2021), "Consumer attitudes toward facial recognition payment: an examination of antecedents and outcomes", *International Journal of Bank Marketing*, Vol. 40 No. 3, pp. 511-535, doi: [10.1108/ijbm-04-2021-0135](https://doi.org/10.1108/ijbm-04-2021-0135).
- Nwankpa, J.K. and Datta, P. (2022), "Leapfrogging healthcare service quality in Sub-Saharan Africa: the utility-trust rationale of mobile payment platforms", *European Journal of Information Systems*, Vol. 31 No. 1, pp. 40-57, doi: [10.1080/0960085x.2021.1978339](https://doi.org/10.1080/0960085x.2021.1978339).
- Oghuma, A.P., Libaque-Saenz, C.F., Wong, S.F. and Chang, Y. (2016), "An expectation-confirmation model of continuance intention to use mobile instant messaging", *Telematics and Informatics*, Vol. 33 No. 1, pp. 34-47, doi: [10.1016/j.tele.2015.05.006](https://doi.org/10.1016/j.tele.2015.05.006).
- Oliver, R.L. (1980), "A cognitive model of the antecedents and consequences of satisfaction decisions", *Journal of Marketing Research*, Vol. 17 No. 4, pp. 460-469, doi: [10.1177/002224378001700405](https://doi.org/10.1177/002224378001700405).
- Pagani, M. and Malacarne, G. (2017), "Experiential engagement and active vs passive behavior in mobile location-based social networks: the moderating role of privacy", *Journal of Interactive Marketing*, Vol. 37, pp. 133-148, doi: [10.1016/j.intmar.2016.10.001](https://doi.org/10.1016/j.intmar.2016.10.001).
- Parasuraman, R., Sheridan, T.B. and Wickens, C.D. (2000), "A model for types and levels of human interaction with automation", *IEEE Transactions on Systems, Man, and Cybernetics-Part A: Systems and Humans*, Vol. 30 No. 3, pp. 286-297, doi: [10.1109/3468.844354](https://doi.org/10.1109/3468.844354).
- Pianca, F. and Santucci, V.G. (2023), "Interdependence as the key for an ethical artificial autonomy", *AI and Society*, Vol. 38 No. 5, pp. 2045-2059, doi: [10.1007/s00146-021-01313-x](https://doi.org/10.1007/s00146-021-01313-x).
- Piper, A. (2019), "About face: the risks and challenges of facial recognition technology", *Risk Management*, Vol. 66 No. 10, pp. 18-23.
- Rahi, S., Alghizzawi, M. and Ngah, A.H. (2023), "Factors influence user's intention to continue use of e-banking during COVID-19 pandemic: the nexus between self-determination and expectation confirmation model", *EuroMed Journal of Business*, Vol. 18 No. 3, pp. 380-396, doi: [10.1108/emjb-12-2021-0194](https://doi.org/10.1108/emjb-12-2021-0194).
- Rahwan, I., Cebrian, M., Obradovich, N., Bongard, J., Bonnefon, J.-F., Breazeal, C., Crandall, J.W., Christakis, N.A., Couzin, I.D., Jackson, M.O., Jennings, N.R., Kamar, E., Kloumann, I.M., Larochelle, H., Lazer, D., McElreath, R., Mislove, A., Parkes, D.C., Pentland, A., Roberts, M.E., Shariff, A., Tenenbaum, J.B. and Wellman, M. (2019), "Machine behaviour", *Nature*, Vol. 568 No. 7753, pp. 477-486, doi: [10.1038/s41586-019-1138-y](https://doi.org/10.1038/s41586-019-1138-y).
- Rasul, T., Wijeratne, A., Soleimani, S. and Lim, W.M. (2023), "Where there's sugar, there are sugar-related mobile apps: what factors motivate consumers' continued use of m-Health?", *Journal of Strategic Marketing*, Vol. 31 No. 4, pp. 856-876, doi: [10.1080/0965254x.2021.1999307](https://doi.org/10.1080/0965254x.2021.1999307).
- Ratchford, M. and Ratchford, B.T. (2021), "A cross-category analysis of dispositional drivers of technology adoption", *Journal of Business Research*, Vol. 127, pp. 300-311, doi: [10.1016/j.jbusres.2021.01.037](https://doi.org/10.1016/j.jbusres.2021.01.037).
- Rijsdijk, S.A. and Hultink, E.J. (2009), "How today's consumers perceive tomorrow's smart products", *Journal of Product Innovation Management*, Vol. 26 No. 1, pp. 24-42, doi: [10.1111/j.1540-5885.2009.00332.x](https://doi.org/10.1111/j.1540-5885.2009.00332.x).

- Rogers, R.W. (1983), "Cognitive and physiological processes in fear appeals and attitude change: a revised theory of protection motivation", in Caccioppo, J. and Petty, R. (Eds), *Social Psychophysiology: A Sourcebook*, Guilford, New York, NY, pp. 153-176.
- Ryan, R.M. and Deci, E.L. (2000), "Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being.", *American Psychologist*, Vol. 55 No. 1, pp. 68-78, doi: [10.1037/0003-066X.55.1.68](https://doi.org/10.1037/0003-066X.55.1.68).
- Shahzad, M.F., Xu, S., Lim, W.M., Hasnain, M.F. and Nusrat, S. (2024), "Cryptocurrency awareness, acceptance, and adoption: the role of trust as a cornerstone", *Humanities and Social Sciences Communications*, Vol. 11 No. 1, pp. 1-14, doi: [10.1057/s41599-023-02528-7](https://doi.org/10.1057/s41599-023-02528-7).
- Shao, Z., Zhang, L., Li, X. and Guo, Y. (2019), "Antecedents of trust and continuance intention in mobile payment platforms: the moderating effect of gender", *Electronic Commerce Research and Applications*, Vol. 33, 100823, doi: [10.1016/j.elerap.2018.100823](https://doi.org/10.1016/j.elerap.2018.100823).
- Sharma, M., Banerjee, S. and Paul, J. (2022), "Role of social media on mobile banking adoption among consumers", *Technological Forecasting and Social Change*, Vol. 180, 121720, doi: [10.1016/j.techfore.2022.121720](https://doi.org/10.1016/j.techfore.2022.121720).
- Sharma, P.N., Liengaard, B.D., Hair, J.F., Sarstedt, M. and Ringle, C.M. (2023), "Predictive model assessment and selection in composite-based modeling using PLS-SEM: extensions and guidelines for using CVPAT", *European Journal of Marketing*, Vol. 57 No. 6, pp. 1662-1677, doi: [10.1108/ejm-08-2020-0636](https://doi.org/10.1108/ejm-08-2020-0636).
- Shi, S., Gong, Y. and Gursoy, D. (2021), "Antecedents of trust and adoption intention toward artificially intelligent recommendation systems in travel planning: a heuristic-systematic model", *Journal of Travel Research*, Vol. 60 No. 8, pp. 1714-1734, doi: [10.1177/0047287520966395](https://doi.org/10.1177/0047287520966395).
- Shiau, W.-L., Sarstedt, M. and Hair, J.F. (2019), "Internet research using partial least squares structural equation modeling (PLS-SEM)", *Internet Research*, Vol. 29 No. 3, pp. 398-406, doi: [10.1108/intr-10-2018-0447](https://doi.org/10.1108/intr-10-2018-0447).
- Shmueli, G., Sarstedt, M., Hair, J.F., Cheah, J.H., Ting, H., Vaithilingam, S. and Ringle, C.M. (2019), "Predictive model assessment in PLS-SEM: guidelines for using PLSpredict", *European Journal of Marketing*, Vol. 53 No. 11, pp. 2322-2347, doi: [10.1108/ejm-02-2019-0189](https://doi.org/10.1108/ejm-02-2019-0189).
- Skalkos, A., Tsohou, A., Karyda, M. and Kokolakis, S. (2024), "Exploring users' attitude towards privacy-preserving search engines: a protection motivation theory approach", *Information and Computer Security*, ahead-of-print, doi: [10.1108/ics-08-2022-0142](https://doi.org/10.1108/ics-08-2022-0142).
- Song, S., Zhao, Y.C., Yao, X., Ba, Z. and Zhu, Q. (2021), "Short video apps as a health information source: an investigation of affordances, user experience and users' intention to continue the use of TikTok", *Internet Research*, Vol. 31 No. 6, pp. 2120-2142, doi: [10.1108/intr-10-2020-0593](https://doi.org/10.1108/intr-10-2020-0593).
- Talluri, S., Kull, T.J., Yildiz, H. and Yoon, J. (2013), "Assessing the efficiency of risk mitigation strategies in supply chains", *Journal of Business Logistics*, Vol. 34 No. 4, pp. 253-269, doi: [10.1111/jbl.12025](https://doi.org/10.1111/jbl.12025).
- Twum, K.K., Kosiba, J.P.B., Hinson, R.E., Gabra, A.Y.B. and Assabil, E.N. (2023), "Determining mobile money service customer satisfaction and continuance usage through service quality", *Journal of Financial Services Marketing*, Vol. 28 No. 1, pp. 30-42, doi: [10.1057/s41264-021-00138-5](https://doi.org/10.1057/s41264-021-00138-5).
- Venkatesh, V., Morris, M.G., Davis, G.B. and Davis, F.D. (2003), "User acceptance of information technology: toward a unified view", *MIS Quarterly*, Vol. 27 No. 3, pp. 425-478, doi: [10.2307/30036540](https://doi.org/10.2307/30036540).
- Wang, X., Wong, Y.D., Sun, S. and Yuen, K.F. (2022), "An investigation of self-service technology usage during the COVID-19 pandemic: the changing perceptions of 'self' and technologies", *Technology in Society*, Vol. 70, 102032, doi: [10.1016/j.techsoc.2022.102032](https://doi.org/10.1016/j.techsoc.2022.102032).
- Watson, G.S. and Durbin, J. (1951), "Exact tests of serial correlation using noncircular statistics", *The Annals of Mathematical Statistics*, Vol. 22 No. 3, pp. 446-451, doi: [10.1214/aoms/117729592](https://doi.org/10.1214/aoms/117729592).
- Wolverton, C.C., Hirschheim, R., Black, W.C. and Burleson, J. (2020), "Outsourcing success in the eye of the beholder: examining the impact of expectation confirmation theory on IT outsourcing", *Information and Management*, Vol. 57 No. 6, 103236, doi: [10.1016/j.im.2019.103236](https://doi.org/10.1016/j.im.2019.103236).

- World Intellectual Property Organization (2021), "Global Innovation Index 2020. Who will finance innovation?", available at: https://www.wipo.int/global_innovation_index/en/2020/ (assessed 15 June 2023).
- Wu, L.W. and Tang, Y.C. (2022), "Mobile payment in omnichannel retailing: dynamics between trust and loyalty transfer processes", *Internet Research*, Vol. 32 No. 6, pp. 1783-1805, doi: [10.1108/intr-06-2021-0402](https://doi.org/10.1108/intr-06-2021-0402).
- Wunderlich, N.V., Wangenheim, F.V. and Bitner, M.J. (2013), "High tech and high touch: a framework for understanding user attitudes and behaviors related to smart interactive services", *Journal of Service Research*, Vol. 16 No. 1, pp. 3-20, doi: [10.1177/1094670512448413](https://doi.org/10.1177/1094670512448413).
- Yang, K. and Jolly, L.D. (2009), "The effects of consumer perceived value and subjective norm on mobile data service adoption between American and Korean consumers", *Journal of Retailing and Consumer Services*, Vol. 16 No. 6, pp. 502-508, doi: [10.1016/j.jretconser.2009.08.005](https://doi.org/10.1016/j.jretconser.2009.08.005).
- Yang, T., Yang, F. and Men, J. (2023), "Understanding consumers' continuance intention toward recommendation vlogs: an exploration based on the dual-congruity theory and expectation-confirmation theory", *Electronic Commerce Research and Applications*, Vol. 59, 101270, doi: [10.1016/j.elerap.2023.101270](https://doi.org/10.1016/j.elerap.2023.101270).
- Yoon, S.J. (2014), "Does social capital affect SNS usage? A look at the roles of subjective well-being and social identity", *Computers in Human Behavior*, Vol. 41, pp. 295-303, doi: [10.1016/j.chb.2014.09.043](https://doi.org/10.1016/j.chb.2014.09.043).
- Yu, S., Levesque-Bristol, C. and Maeda, Y. (2018), "General need for autonomy and subjective well-being: a meta-analysis of studies in the US and East Asia", *Journal of Happiness Studies*, Vol. 19 No. 6, pp. 1863-1882, doi: [10.1007/s10902-017-9898-2](https://doi.org/10.1007/s10902-017-9898-2).
- Zhang, R., Jun, M. and Palacios, S. (2023), "M-shopping service quality dimensions and their effects on customer trust and loyalty: an empirical study", *International Journal of Quality and Reliability Management*, Vol. 40 No. 1, pp. 169-191, doi: [10.1108/ijqrm-11-2020-0374](https://doi.org/10.1108/ijqrm-11-2020-0374).
- Zhong, J.Y. and Mitchell, V.W. (2012), "Does consumer well-being affect hedonic consumption?", *Psychology and Marketing*, Vol. 29 No. 8, pp. 583-594, doi: [10.1002/mar.20545](https://doi.org/10.1002/mar.20545).
- Zhong, Y., Oh, S. and Moon, H.C. (2021), "Service transformation under industry 4.0: investigating acceptance of facial recognition payment through an extended technology acceptance model", *Technology in Society*, Vol. 64, 101515, doi: [10.1016/j.techsoc.2020.101515](https://doi.org/10.1016/j.techsoc.2020.101515).
- Zhou, T. (2014), "Understanding the determinants of mobile payment continuance usage", *Industrial Management and Data Systems*, Vol. 114 No. 6, pp. 936-948, doi: [10.1108/imds-02-2014-0068](https://doi.org/10.1108/imds-02-2014-0068).

Action autonomy (AA)

- AA1: Facial recognition payment can independently complete the operation of the payment
 AA2: Facial recognition payment can independently implement the operation of the payment
 AA3: Facial recognition payment can autonomously perform the operation of the payment
 AA4: Facial recognition payment can carry out the operation of the payment autonomously

Sensing autonomy (SA)

- SA1: Facial recognition payment can autonomously be aware of me from the state of its surroundings
 SA2: Facial recognition payment can autonomously recognise me from the environment
 SA3: Facial recognition payment can independently recognise me from the environment
 SA4: Facial recognition payment can independently monitor me from the environment

Thought autonomy (TA)

- TA1: Facial recognition payment can autonomously provide me choices of what to do without requiring human intervention
 TA2: Facial recognition payment can independently provide me recommendations for action plans for assigned matters without requiring human intervention
 TA3: Facial recognition payment can independently recommend me an implementation plan of the assigned matters without requiring human intervention
 TA4: Facial recognition payment can autonomously suggest to me on what can be done without requiring human intervention

Perceived technology security (PTS)

- PTS1: The risk of an unauthorised party intervening in the payment process is low
 PTS2: The risk of abuse of user's information (e.g. payment amount, transaction history, purchasing patterns) is low when using a facial recognition payment
 PTS3: The risk of abuse of payment information (e.g. bank account number and/or data) is low when using a facial recognition payment
 PTS4: Overall, facial recognition payment is a safe platform in protecting sensitive information about myself

Payment service enhancement (PSE)

- PSE1: Facial recognition payment offers customers more options in paying
 PSE2: Facial recognition payment enables the paying process to be easier and faster
 PSE3: Facial recognition payment makes the paying process less hassle
 PSE4: Facial recognition payment makes paying process more fun
 PSE5: Facial recognition payment enhances customer service

Trust: Cognitive trust (CT)

- CT1: Facial recognition payment always provides me with an accurate financial service
 CT2: Facial recognition payment always provides me with a reliable financial service
 CT3: Facial recognition payment always provides me with a safe financial service

Trust: Emotional trust (ET)

- ET1: I feel secure using facial recognition payment for my payment
 ET2: I feel comfortable using facial recognition payment for my payment
 ET3: I feel content using facial recognition payment for my payment
 Global item: Overall, I trust the use of facial recognition payment for my payment

Subjective well-being (SWB)

- SWB1: Using facial recognition payment is part of my ideal life
 SWB2: The conditions of my life using facial recognition payment are excellent
 SWB3: I am satisfied with my life when I am using facial recognition payment
 SWB4: I am able to make transactions by using facial recognition payment

Continuance use intention (CUI)

- CUI1: I intend to continue using facial recognition payment
 CUI2: I plan to keep using facial recognition payment
 CUI3: I expect to continue using facial recognition payment
 CUI4: If I could, I would like to continue my use of facial recognition payment

Source(s): Authors' own illustration

Table A1.
Measurement items

Table A2.
Assessment of
common method bias
(CMB) using
unmeasured latent
method
construct (ULMC)

Construct	Path	Substantive loading	Substantive variance	t-value	Path	Method loading	Method variance	t-value
Action autonomy (AA)	AA → AA1	0.907	0.823	46.772**	Method → AA1	-0.043	0.002	0.576
	AA → AA2	0.903	0.815	46.830**	Method → AA2	-0.046	0.002	1.191
	AA → AA3	0.892	0.796	48.347**	Method → AA3	0.048	0.002	0.848
	AA → AA4	0.876	0.767	40.512**	Method → AA4	0.040	0.002	0.872
Sensing autonomy (SA)	SA → SA1	0.864	0.746	20.922**	Method → SA1	-0.045	0.002	1.278
	SA → SA2	0.900	0.810	36.053**	Method → SA2	0.050	0.003	0.970
	SA → SA3	0.870	0.757	44.274**	Method → SA3	0.043	0.002	0.790
	SA → SA4	0.822	0.676	40.885**	Method → SA4	-0.040	0.002	0.247
Thought autonomy (TA)	TA → TA1	0.786	0.618	32.397**	Method → TA1	0.167	0.028	3.335**
	TA → TA2	0.911	0.830	27.000**	Method → TA2	-0.047	0.002	1.453
	TA → TA3	0.877	0.769	46.025**	Method → TA3	-0.047	0.002	0.236
	TA → TA4	0.877	0.769	30.636**	Method → TA4	-0.042	0.002	0.722
Perceived technology security (PTS)	PTS → PTS1	0.903	0.815	49.059**	Method → PTS1	0.151	0.023	3.267**
	PTS → PTS2	0.913	0.834	42.803**	Method → PTS2	0.050	0.003	0.741
	PTS → PTS3	0.919	0.845	47.290**	Method → PTS3	-0.219	0.048	4.318
	PTS → PTS4	0.879	0.773	33.954**	Method → PTS4	0.155	0.024	1.962*

(continued)

Construct	Path	Substantive loading	Substantive variance	t-value	Path	Method loading	Method variance	t-value
Payment service enhancement (PSE)	PSE → PSE1	0.768	0.590	6.584**	Method → PSE1	0.048	0.002	0.408
	PSE → PSE2	0.972	0.945	17.357**	Method → PSE2	-0.168	0.028	5.396**
	PSE → PSE3	0.873	0.762	38.063**	Method → PSE3	-0.043	0.002	1.511
	PSE → PSE4	0.755	0.570	34.060**	Method → PSE4	0.171	0.029	3.439**
	PSE → PSE5	0.740	0.548	23.958**	Method → PSE5	0.148	0.022	3.289**
Trust: Cognitive trust (CT)	CT → CT1	0.892	0.796	35.730**	Method → CT1	0.038	0.001	0.320
	CT → CT2	0.943	0.889	48.061**	Method → CT2	-0.158	0.025	3.305**
	CT → CT3	0.859	0.738	34.628**	Method → CT3	0.037	0.001	1.377
Trust: Emotional trust (ET)	ET → ET1	0.936	0.876	35.166**	Method → ET1	-0.033	0.001	0.450
	ET → ET2	0.910	0.828	32.425**	Method → ET2	0.029	0.001	0.267
	ET → ET3	0.927	0.859	42.551**	Method → ET3	0.015	0.000	0.189
	SWB → SWB1	0.948	0.899	20.667**	Method → SWB1	0.031	0.001	0.392
Subjective well-being (SWB)	SWB → SWB2	0.899	0.808	29.089**	Method → SWB2	-0.048	0.002	1.247
	SWB → SWB3	0.902	0.814	30.709**	Method → SWB3	-0.045	0.002	0.216
	SWB → SWB4	0.878	0.771	32.655**	Method → SWB4	0.043	0.002	0.879
	CUI → CUI1	0.915	0.837	36.123**	Method → CUI1	0.042	0.002	0.789
Continuance use intention (CUI)	CUI → CUI2	0.957	0.916	38.285**	Method → CUI2	-0.137	0.019	2.916**
	CUI → CUI3	0.938	0.880	38.130**	Method → CUI3	-0.047	0.002	0.499
	CUI → CUI4	0.864	0.746	21.191**	Method → CUI4	0.043	0.002	0.772
Average Ratio			0.786				0.008	94.101

Note(s): * $p < 0.05$; ** $p < 0.01$

Source(s): Authors' own illustration

Table A2.

Table A3.
Cross-loadings

Item	Action autonomy (T1)	Sensing autonomy (T1)	Thought autonomy (T1)	Perceived technology security (T1)	Perceived service enhancement (T2)	Trust: Cognitive trust (T2)	Trust: Emotional trust (T2)	Subjective well-being (T2)	Continuance use intention (T3)
AA1	0.897	0.565	0.544	0.386	0.500	0.439	0.398	0.456	0.456
AA2	0.884	0.531	0.548	0.382	0.486	0.423	0.388	0.448	0.446
AA3	0.906	0.571	0.559	0.418	0.510	0.454	0.430	0.479	0.478
AA4	0.891	0.557	0.547	0.415	0.498	0.451	0.406	0.467	0.485
SA1	0.537	0.870	0.522	0.459	0.478	0.461	0.464	0.491	0.499
SA2	0.542	0.879	0.513	0.426	0.515	0.494	0.459	0.459	0.450
SA3	0.544	0.868	0.495	0.420	0.518	0.460	0.455	0.493	0.484
SA4	0.527	0.840	0.537	0.451	0.471	0.486	0.471	0.481	0.448
TA1	0.538	0.546	0.840	0.427	0.483	0.539	0.437	0.516	0.449
TA2	0.524	0.515	0.883	0.421	0.500	0.501	0.426	0.484	0.450
TA3	0.519	0.523	0.871	0.441	0.490	0.495	0.438	0.495	0.457
TA4	0.541	0.478	0.859	0.427	0.487	0.491	0.415	0.480	0.438
PTS1	0.419	0.491	0.472	0.938	0.506	0.646	0.805	0.776	0.695
PTS2	0.426	0.457	0.471	0.930	0.517	0.618	0.771	0.760	0.693
PTS3	0.386	0.441	0.440	0.916	0.440	0.590	0.736	0.723	0.632
PTS4	0.427	0.494	0.461	0.926	0.520	0.638	0.772	0.775	0.697
PSE1	0.448	0.430	0.488	0.419	0.780	0.488	0.482	0.474	0.462
PSE2	0.427	0.421	0.426	0.365	0.831	0.410	0.431	0.458	0.474
PSE3	0.459	0.516	0.438	0.415	0.836	0.454	0.478	0.507	0.521
PSE4	0.461	0.484	0.455	0.474	0.816	0.475	0.479	0.550	0.515
PSE5	0.488	0.495	0.517	0.509	0.841	0.538	0.502	0.571	0.566
CT1	0.470	0.504	0.561	0.582	0.525	0.898	0.596	0.610	0.511
CT2	0.459	0.498	0.528	0.564	0.532	0.904	0.604	0.601	0.501
CT3	0.404	0.479	0.494	0.661	0.502	0.892	0.691	0.642	0.530
ET1	0.426	0.509	0.459	0.792	0.499	0.672	0.925	0.717	0.638
ET2	0.398	0.488	0.451	0.737	0.563	0.630	0.917	0.737	0.677
ET3	0.434	0.484	0.467	0.777	0.545	0.647	0.930	0.739	0.648
SWB1	0.442	0.510	0.501	0.730	0.562	0.605	0.710	0.907	0.741
SWB2	0.499	0.517	0.564	0.767	0.582	0.636	0.730	0.926	0.735
SWB3	0.468	0.521	0.552	0.767	0.592	0.646	0.741	0.923	0.722

(continued)

Item	Action autonomy (T1)	Sensing autonomy (T1)	Thought autonomy (T1)	Perceived technology security (T1)	Perceived service enhancement (T2)	Trust: Cognitive trust (T2)	Trust: Emotional trust (T2)	Subjective well-being (T2)	Continuance use intention (T3)
SWB4	0.467	0.469	0.454	0.702	0.536	0.609	0.686	0.869	0.706
CUI1	0.488	0.512	0.498	0.716	0.572	0.550	0.674	0.754	0.934
CUI2	0.490	0.505	0.457	0.673	0.588	0.507	0.648	0.707	0.925
CUI3	0.476	0.499	0.479	0.662	0.569	0.532	0.652	0.728	0.923
CUI4	0.462	0.483	0.475	0.641	0.552	0.516	0.626	0.754	0.892
Note(s): Table A3 presents a discriminant analysis method through cross-loading comparison between constructs. The results indicate that the loadings of indicators on their assigned latent variable (italic values) exceed those on other latent variables by more than 0.1 (Chin, 1998). This confirms that our constructs achieve discriminant validity and are clearly distinct from one another									
Source(s): Authors' own illustration									

Table A3.

About the authors

Xin-Jean Lim is affiliated in Business School in Sun Yat-Sen University, China and School of Business and Economics, Universiti Putra Malaysia, Malaysia. Her primary research interests include consumer behaviour, social media marketing, online marketing, customer relationship management and technology marketing. Her research papers have been published in reputable business, tourism, and information system journals, including *Technological Forecasting and Social Change*, *Journal of Retailing and Consumer Services*, *Industrial Management and Data Systems*, *International Journal of Hospitality and Management*, *Internet Research*, *Journal of Strategy Marketing*, *Asia Pacific Journal of Marketing and Logistics*, amongst others. She is also currently serving as the editorial board members and reviewers for several business and management journals. She can be contacted at: lim.xinjean@yahoo.com

Jun-Hwa Cheah (Jacky) is Associate Professor of the Norwich Business School at the University of East Anglia in the United Kingdom. His interests include consumer marketing, digital marketing and data analytics. He has published in international journals such as the *British Journal of Management*, *European Journal of Marketing*, *International Journal of Contemporary Hospitality Management*, *International Journal of Hospitality Management*, *Internet Research*, *Information Systems Management*, *Journal of Business Research*, *Journal of Retailing and Consumer Services*, *Journal of Travel Research*, *Journal of Strategic Marketing*, *Psychology & Marketing*, *Technology Forecasting and Social Change and Tourism Management*, among others. He is also a recipient of the Emerald Young Researcher Award from Emerald Publishing. Jun-Hwa Cheah is the corresponding author and can be contacted at: jackycheahjh@gmail.com, J.Cheah@uea.ac.uk

Jennifer Yee-Shan Chang is Lecturer at the Edge Hotel School, University of Essex, UK. Her research interests include tourist experiences, technology applications in hospitality and tourism, and human-machine collaboration. She has published in international journals such as the *International Journal of Hospitality Management* and the *Journal of Hospitality and Tourism Research*, among others. She can be contacted at y.chang@essex.ac.uk.

Weng Marc Lim is Distinguished Professor and the Dean of Sunway Business School at Sunway University in Malaysia. He is also Adjunct Professor at Swinburne University of Technology's home campus in Melbourne, Australia, and its international branch campus in Sarawak, Malaysia. His interests include business, consumer, and government (BCG) research. He has authored more than 100 manuscripts in journals ranked 'A*' and 'A' such as *Australasian Marketing Journal*, *European Journal of Marketing*, *Industrial Marketing Management*, *Journal of Advertising*, *Journal of Advertising Research*, *Journal of Business Research*, *Journal of Business and Industrial Marketing*, *Journal of International Marketing*, *Journal of Consumer Behaviour*, *Journal of Consumer Marketing*, *International Journal of Consumer Studies*, *Journal of Brand Management*, *Journal of Product and Brand Management*, *Journal of Retailing and Consumer Services*, *Journal of Strategic Marketing*, *Marketing Theory*, *Marketing Intelligence and Planning* and *Psychology and Marketing*, among others. He has also presented his work and led high-level policy discussions at the United Nations Educational, Scientific and Cultural Organization and the World Economic Forum. Contact: [@limwengmarc](https://www.wengmarc.com) on Instagram and Twitter or his personal homepage at <https://www.wengmarc.com>.

Alastair M. Morrison is Research Professor at the University of Greenwich in London, UK, and formerly Distinguished Professor Emeritus at Purdue University, USA, specialising in the area of tourism and hospitality marketing. He has published 300 academic articles and conference proceedings. He is the author of five books: *Marketing and Managing Tourism Destinations*, 2nd edition (Routledge, 2019); *The Tourism System*, 8th edition (Kendall/Hunt Publishing Company, 2018); *Global Marketing of China Tourism* (China Architectural and Building Press, 2012); *Hospitality and Travel Marketing*, 4th edition (Delmar Publishers, Inc., 2010) and *Tourism: Bridges across Continents* (McGraw-Hill Australia, 1998). He is also the Co-Editor-in-Chief of the *International Journal of Tourism Cities*. He can be contacted at a.morrison@greenwich.ac.uk.

Yogesh K. Dwivedi is Professor of Digital Marketing and Innovation and the Founding Director of the Emerging Markets Research Centre (EMaRC) at the School of Management, Swansea University, Wales, UK. He holds a Distinguished Research Professorship at the Symbiosis Institute of Business Management (SIBM), Pune, India, and is leading the *International Journal of Information Management* as its Editor-in-Chief. His research interests are at the interface of information systems and marketing, focusing on issues related to consumer adoption and diffusion of emerging digital innovations, digital government and digital and social media marketing, particularly in the context of emerging markets.

He has published more than 500 articles in a range of leading academic journals and conferences that are widely cited (more than 50 thousand times as per Google Scholar). He has been named on the annual Highly Cited ResearchersTM lists from Clarivate Analytics. He is also Associate Editor of the *Journal of Business Research*, the *European Journal of Marketing*, *Government Information Quarterly* and *International Journal of Electronic Government Research* and Senior Editor of the *Journal of Electronic Commerce Research*. He can be contacted at y.k.dwivedi@swansea.ac.uk. Internet Research