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Mobile wallet adoption intention amid COVID-19 pandemic outbreak: A novel conceptual framework

Ashwarya Kapoor a, *, Rajiv Sindwani a, Manisha Goel a, Amit Shankar b

a J. C. Bose University of Science and Technology, YMCA, Faridabad, India
b Indian Institute of Management, Visakhapatnam, Andhra Pradesh, India

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ABSTRACT
This research aims to explore adoption intention towards mobile wallet (m-wallet) amid COVID-19 outbreak using mediated-moderation framework. This study, in its uniqueness, utilises the stimulus-organism-response (S–O–R) theory as its theoretical base. The study investigated the effect of relative advantage, ease of effort, favourable infrastructure conditions, security considerations, and touch-free transactions on m-wallet adoption. The model includes perceived values as a mediator and perceived critical mass (PCM), promotional benefits (PBs) and users’ demographics as moderators for deeper understanding of the phenomenon. A total of 327 responses were collected using purposive sampling method. The results revealed that relative advantage, favourable infrastructure conditions, security considerations and touch-free transactions exert a positive significant effect on m-wallet adoption intention. Further, except for ease of effort, perceived values mediate the association among antecedents and adoption intention and PCM, PBs and age found to be crucial moderators between perceived values and intention. This study enriches the existing literature on the adoption of m-wallet. Practically, this study helps marketers frame strategies to enhance the adoption and usage of m-wallet.

1. Introduction

The COVID-19 crisis has bought a major transformation in users’ experience worldwide in encouraging remote work and modifying their behaviour (Shishah and Alhelaly, 2021). Mobile communication and advanced information technology played a significant role during the COVID-19 pandemic (Shankar et al., 2021). Though the shift towards mobile technology-based business solutions had already begun much before the pandemic, the COVID-19 has fostered the transformation (Soodan and Rana, 2020). Mobile wallet (m-wallet) is among one such mobile commerce initiatives which emerged as one of the innovative touch-free payment solutions. M–wallet facilitate users by allowing them to utilise payments and loyalty cards, make peer-to-peer payments, save e-receipts, pay bills, and use coupons directly from the application, thereby enabling users’ money to move along with their smartphones (Kapoor et al., 2020; Mew and Millan, 2021). M–wallets can also be utilised to store sensitive information such as passports, insurance policies and online shopping accounts in an encrypted format (Shin, 2009; Shankar, 2021). It has been claimed that m-wallets are comparatively simple to operate and superior to the traditional payment methods as they permit users to go cashless and facilitate proximity and remote payments (Sharma et al., 2018). Particularly, after demonetisation, India witnessed a serious issue in making payment due to limited availability of the hard cash and people started showing favourable intention towards digital payment (Chawla and Joshi, 2019). COVID-19 pandemic has further accelerated the consumers favourable intention towards m-wallets (Sarmah et al., 2021). Preventive measures like social distancing compelled users to utilise m-wallets for making payments and transferring money. During the nationwide lockdown, usage of m-wallets surged by 44 % in India. “PayTM” and “Google pay” emerged as widely used m-wallet apps (Undale et al., 2020). Business Standard reported that in terms of value, the m-wallet transactions are estimated to increase from Rs 5500 crore in 2015–2016 to Rs 30,000 crore in 2022 (Undale et al., 2020). Various incentives like Rs 1500 crore scheme for promoting digital payments in the 2021 budget introduced by the Indian Government, reward points and cashback offers by service providers further motivated people to use m-wallets (Singh et al., 2020). Although Indian consumers have started showing interest towards digital payment adoption, the usage of m-wallets in India is not very encouraging (Chawla and Joshi, 2019; Shankar and Behl, 2021). Urban consumers

* Corresponding author.
E-mail addresses: ashwaryakapoor@jcboseust.ac.in (A. Kapoor), rajiv_sindwani@jcboseust.ac.in (R. Sindwani), manisha.singla@jcboseust.ac.in (M. Goel), ashankar@iimv.ac.in (A. Shankar).

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have started using m-wallet, but perceived risks associated with m-wallet have enhanced semi-urban and rural consumers’ inertia towards adoption and usage of m-wallet. Hence, m-wallet service providers are keen to know the ways to enhance the adoption and usage intention towards m-wallet, and therefore, it has attracted researchers’ and practitioners’ attention in India (Chawla and Joshi, 2019, 2020; Shankar and Behl, 2021). The research on consumer behavioural intention towards m-wallet adoption is at a nascent stage in India (Chawla and Joshi, 2020). With disruptive changes, enormous uncertainty, and panic disorder during the current pandemic, understanding consumer behavioural intentions has become even more critical (Hossain, 2021). Further as per authors’ knowledge, there is hardly any study that explores the m-wallet adoption intention amid COVID-19 in India. This study attempts to fill this gap by proposing a comprehensive mediated-mediation framework to examine user intention to adopt m-wallet in the light of the ongoing pandemic. Previous studies majorly focussed on how different internal and external cues affect m-wallet adoption and they ignored the role played by different intervening variables in adoption process. Literature suggested that perceived values play a crucial role in framing behavioural intention towards new technology adoption (Kaur et al., 2020; Shankar, 2021). Consumers have favourable or unfavourable intention towards specific new technology based on perceived values received from new technology (Sheth, 2021). Hence, it is crucial to understand how values help in framing intention towards m-wallet adoption. In the existing literature, scant efforts were made to investigate the role of perceived values in the process of m-wallet adoption. Thus, this study attempts to investigate the mediating effect of perceived values. Moreover, the effect of different external and internal variables on consumer behaviour is not straightforward (Shankar et al., 2021) and this makes it crucial to investigate how different moderating variables play a role in framing consumer intention towards m-wallet adoption intention. To enrich the existing literature, the present study aims to investigate the moderating role of perceived critical mass (PCM), promotional benefits (PBs) and demographics (gender, age, and education) for a better understanding of the phenomenon. Thus the present study addresses the following research objectives:

1) To figure out the relevant technology adoption dimensions and examining their impact on m-wallet adoption intention during COVID-19 outbreak
2) To understand the role of mediator and moderators in the proposed model

The study carries several theoretical and managerial implications. Theoretically, this study contributes to the existing m-wallet literature by investigating consumer adoption intention using the comprehensive moderated-mediation framework. This study also enriches the stimulus–organism–response (S–O–R) theory by using it as theoretical base to investigate the impact of antecedents on m-wallet adoption intention. Practically, this study helps m-wallet service providers to understand how to create and implement strategies to enhance the adoption and usage in emerging market.

The remaining paper is organised as follows: Section 2 consists of comprehensive review of studies related to m-wallet adoption which assists in identifying various factors and proposing hypotheses. Section 3 discusses the research method followed by data analysis. The discussion and conclusion are explained in Section 5. Theoretical and practical implications are exhibited in Sections 6 and 7 respectively. Afterwards, limitations and future research scope are discussed in Section 8.

2. Theoretical background

A review of literature in the domain of electronic payments uncovers that researchers have employed several theoretical frameworks to explore adoption intention among consumers (Shankar and Datta, 2018). Eminent among them are the technology acceptance model (TAM), the unified theory of acceptance and use of technology (UTAUT) and the diffusion of innovation theory (DOI). Shin (2009) employed the TAM and UTAUT models and extended them with dimensions of assurance, self-efficacy and social influence. Yang et al. (2012) proposed a model to analyse the adoption of mobile payment services by combining the theory of reasoned action and the DOI theory. Their study offered new insights in the area of innovation adoption by introducing social influences, behavioural beliefs and personal traits over pre and post stages of adoption. Shaw (2014) developed an extended TAM model by adding essential dimensions such as facilitating conditions, lifestyle compatibility and assurance. Martins et al. (2014) merged UTAUT with the perceived risk to analyse user behavioural intention in the domain of internet banking. Oliveira et al. (2016) came out with a model integrating UTAUT2 and the DOI theory to understand barriers and facilitators of mobile payments. Singh et al. (2017) determined user perception through an integrated UTAUT model. They further proposed that user perception impacted m-wallet usage rates. Owusu et al. (2020) utilised the innovation development theory and the TAM as their theoretical development for proposing a research model in context of mobile banking adoption. George and Sunny (2021) established an adoption model based on the TAM and extended it by adding factors like promotional offers and trust. Garrouch (2021) proposed the TAM in the context of m-wallet including reputation of the provider, trust, safety, and assurance of m-wallet applications.

TAM and UTAUT were utilised by researchers in the past for their adoption models. But these have been criticised because of their limitations. TAM and UTAUT were originally developed in an organisational context to understand the technology adoption of employees and lacked attributes on ‘individuals’ who engage with technology that could be influential in explaining their dispositions towards use of underlying technology (Agarwal and Prasad, 1999; Venkatesh et al., 2012). Looking at the shortcomings of existing models used in the literature, authors used the S–O–R framework as a theoretical support for the proposed model. Hence, through the proposed work, an attempt has been made to reinforce the existing models. Essential dimensions have been added to perceive the role of individual differences in the adoption process. A new dimension named “touch-free transactions” has also been proposed in the context of an ongoing pandemic. The proposed model also includes perceived values as a mediating dimension to predict the adoption intention of an individual. The research model with appropriate hypotheses has been exhibited in Fig. 1. Section 3 on the development of hypotheses explain the various constructs used in the study and demonstrates the relationship between constructs in the proposed model.

3. Theoretical support

This study uses the S-O-R theory, developed by Mehrabian and Russell (1974), as a theoretical base for analysing the relationship between m-wallet antecedents and adoption intention. It gives a broad scenario about how users perceive stimulus present in the environment and respond to it. S-O-R theory holds some limitations. In comparison to technology adoption theories (TAM, TPB, UTAUT, DOI), S-O-R is a contextual theory which is not based on specific variables. Classification of study variables into stimuli, organism, and response is a complex process. Moreover, the S-O-R does not emphasise on the role of emotion during interaction with environmental cues. Irrespective of above-mentioned limitations, literature suggested that S-O-R is one of the suitable theories to measure the effect of environmental cues on consumers’ response towards new technology (Kawaf and Tagg, 2012). Hence, The S-O-R model has been widely utilised by researchers in various domains such as online purchase intention (Kim and Lennon, 2013), electric vehicle adoption intention (Xu et al., 2020), online hotel booking intention (Emir et al., 2016) and showrooiming intention (Shankar et al., 2021) to explore the consumer behavioural intention. But limited efforts have been made to analyse m-wallet adoption intention using the S-O-R framework. The S-O-R model states that...
“environmental cues (stimuli) impact cognitive state (organism) that drives user behaviour (response)” (Mehrabian and Russell, 1974). In the present study, relative advantage, ease of effort, favourable infrastructure conditions, security considerations and touch-free transactions are taken as stimuli. The user perceived values is determined as organism that drives m-wallet adoption intention as response.

3.1. Hypotheses development

3.1.1. Relative advantage

Researchers in previous studies claimed that relative advantage is identical to perceived usefulness (Shankar and Datta, 2018). It is the extent to which a customer thinks that utilising a specific system would enhance their job functioning (Davis, 1989). It is among the key factors determining the attitude that persuades customers to accept more modern and user-friendly technologies. When customers recognise the relative advantage provided by m-wallets over offline payment methods and other digital payment alternatives, they are likely to create a favourable perception towards it (Chawla and Joshi, 2019). Researchers have analysed the association between relative advantage and intention (Chawla and Joshi, 2019; Mew and Millan, 2021; Zhang and Mao, 2020). Thus, the following hypothesis is drawn.

H1. Relative advantage has a direct positive effect on m-wallet adoption intention.

3.1.2. Ease of effort

It is the extent to which customers think that utilising a system will be straightforward (Davis, 1989; Kapoor et al., 2022). In the ease of m-wallet, it is the extent to which the customers think that the effort needed to utilise m-wallets would be minimal (Chawla and Joshi, 2019). User-friendly application layout and availability anywhere round the clock provide people with an opportunity to use m-wallets widely. Thus, the ease of effort may encourage customers to utilise mobile payments and positively influence their intention to adopt m-wallets widely, whereas technical constraints like difficulty in data entry or small screen size led to dissatisfaction and non-acceptance among some users (Shankar and Datta, 2018). Studies in the past literature outlined the impact of ease of effort on users’ intention (Chawla and Joshi, 2017; George and Sunny; 2021; Sarmah et al., 2021). Thus, researchers propose the following hypothesis.

H2. Ease of effort has a direct positive effect on m-wallet adoption intention.

3.1.3. Favourable infrastructure conditions

Infrastructure conditions are the degree to which customers believe that organisational and technical infrastructure is accessible to assist the utilisation of m-wallet (Venkatesh et al., 2003). It refers to environmental factors that affect an individual’s desire to carry out a task (Teo et al., 2008). The availability of knowledge, support and resources increases technology usage among users (Soodan and Rana 2020). Authors in various studies established a link between favourable infrastructure conditions and users’ intention to utilise mobile banking, mobile commerce, and mobile payments (Anshari et al., 2021; Chawla and Joshi, 2019; Soodan and Rana, 2020). Therefore, the following hypothesis is postulated.

H3. Favourable infrastructure conditions have a direct positive effect on m-wallet adoption intention.

3.1.4. Security considerations

It refers to the extent to which a customer presumes that utilising an m-wallet payment channel is safe (Shin, 2009). Security considerations not only include technical aspects like authentication and confidentiality, but also users’ comprehensive sense of security and well-being (Shin, 2009). Despite having technological and support structures, building trust is significant for electronic transactions (Shaw, 2014). Consumers must trust that payment for transactions will be settled as per their expectations and their personal information would not be disclosed to inappropriate parties (Shaw, 2014). Studies have depicted the relationship between security considerations and users’ adoption intention (Bhattacharyya et al., 2021; Chawla and Joshi, 2017; 2019). Therefore, we posit the following hypothesis.

H4. Security considerations have a direct positive effect on m-wallet adoption intention.

3.1.5. Touch-free transactions

In the wake of the pandemic, touch-free payments have seen a prompt surge. It is becoming a new norm to circumvent health threats. As specified by the World Health Organisation, one of the major reasons for the transmission of corona virus is the usage of paper money, physical cards and coins for financial transactions between users and

Fig. 1. Proposed Conceptual Model.
Corporations of Delhi and Mumbai are planning a contactless ticketing towards m-wallet adoption. This in turn could lead to the diffusion of m-wallet service providers (Auer et al., 2020). Taking into consideration the uncertainty of infected surfaces, touch-free or contactless payments via m-wallet are perceived as the most hygienic way of performing transactions as they allow zero human interactions and are in line with social distancing norms (Bradford, 2021). M-wallet service providers observed an increase in their customer base since February 2020 (Dey et al., 2020; Kapoor et al., 2021a). To push digital payments and minimise the contact between drivers and toll booth operators, the Government of India has made FASTag compulsory. The Metro Rail Corporations of Delhi and Mumbai are planning a contactless ticketing system. Various e-commerce platforms are also encouraging users to pay through m-wallets and other digital modes. Touch-free transactions have got a range of benefits from the users’ perspective. They are more efficient, convenient, safe and environment friendly. While literature covered studies showing light on the adoption of m-wallets, there is hardly any study testing the impact of touch-free payment on users’ intention during COVID-19. Therefore, the following hypothesis can be postulated.

**H5.** Touch-free transactions have a direct positive effect on m-wallet adoption intention.

### 3.1.6. Mediating role of perceived values

Perceived values are the values that users receive in exchange for the money that they spend to utilise the product or service (Madan and Yadav, 2016). It is a trade-off between benefits received (in the form of quality and utilities) and sacrifices made by users (in the form of time, efforts, and money) (Zeithaml, 1998). In the context of m-wallet, users receive utilitarian and hedonic values. Utilitarian values are the overall assessment of functional benefits and sacrifices. While hedonic values refer to the complete assessment of experiential benefits and sacrifices (Jebbarakirhity and Shankar, 2021; Overby and Lee, 2006). Efforts, time and price paid by users are the perceived costs.

Perceived values may be an important mediator that affects users’ m-wallet adoption intention. Users receive several benefits that motivate intention behaviour. M-wallet provides the users with a relative advantage as it is more effective and efficient than other electronic payment systems (Chawla and Joshi, 2020; Kaur et al., 2020). Users experience ease as m-wallets are user-friendly, and save time and mental efforts (Kapoor et al., 2021b; Sindwani and Goel, 2016). Organisational and technical foundations are in pace to brace the use of m-wallet (Bhattacharyya et al., 2021). Users naturally develop a favourable perception towards technology based on the availability of required resources (Shankar and Jain, 2021). This could lead to adoption intention (Chawla and Joshi, 2017; Garrouchi, 2021). As risk is involved while performing financial transactions using m-wallet, security is considered to be one of the key benefits. It is essential because of the sensitive and confidential nature of transactions (Chawla and Joshi, 2020). Thus, security considerations are perceived by users as an essential value that might subsequently affect behavioural intentions (Chawla and Joshi, 2020). People are switching to touch-free payments to avoid the possibility of contracting COVID-19 infection from exchanging cash. Since contactless payment is a new method of payment in India as compared to other online payment methods, it is believed that touch-free transactions experience will play a key role in influencing users’ perceived values towards m-wallet adoption. This in turn could lead to the diffusion of m-wallet. The abovementioned discussion suggests that perceived values might mediate the association between proposed antecedents to perceived values (relative advantage, ease of effort, security considerations, favourable infrastructure conditions and touch-free transactions) and m-wallet adoption intention. To investigate these mediating effects, the following hypotheses are proposed.

**H6.** Perceived values mediate the relationship between relative advantage and m-wallet adoption intention.

**H7.** Perceived values mediate the relationship between the ease of effort and m-wallet adoption intention.

**H8.** Perceived values mediate the relationship between favourable infrastructure conditions and m-wallet adoption intention.

**H9.** Perceived values mediate the relationship between security considerations and m-wallet adoption intention.

**H10.** Perceived values mediate the relationship between touch-free transactions and m-wallet adoption intention.

#### 3.1.7. Moderating role of perceived critical mass, promotional benefits and demographics

PCM is a construct that has got an important role to play in driving users’ behaviour (Lew et al., 2020). Any useful technology would not be utilised much unless there is a critical mass of users for it. PCM refers to “the point at which innovation have been adopted by adequate users, so that the innovation’s further rate of adoption becomes self-sustaining” (Rogers, 1995). It makes consumers feel that as the number of users rises, the technology would become more superior and worthwhile. PCM could strengthen users’ confidence in overall values perceived by the users. Similarly, the more confident the user is, the more probable their perceived values will guide their adoption behaviour. While the influence of PCM on intention has been analysed by researchers (George and Sunny, 2021; Illia et al., 2018), its role as a moderator between perceived values and intentions to adopt in the context of mobile payments has not been examined yet. PCM may act as an important moderator in association between perceived values and adoption intentions. High PCM would lead to a stronger association between perceived values and intention to adopt m-wallet than lower PCM since number of users among the referent group of a person who is using m-wallets for performing transactions will impact their intention to adopt m-wallet. To test the moderating role of PCM, we formulated the following hypothesis.

**H11.** PCM moderates the relationship between perceived values and m-wallet adoption intention such that the association between perceived values and m-wallet adoption is stronger when PCM is high than when it is low.

In social psychology and psychology literature, studies revealed that perceived benefits could be strengthened by intrinsic and extrinsic rewards (Blau, 1964). Rewards have been considered as an essential dimension in behavioural decisions (Fisher and Ackerman, 1998). This concept of using PBs or rewards for positive augmentation is popular in the domain of marketing. With rising competition in the world of digital payments and prevalent COVID-19 upsurge, PBs have become an essential antecedent to m-wallet adoption. It refers to various kinds of benefits like cash discounts, coupon codes, app download cash rewards and other freebies provided by m-wallet service providers to consumers (Madan and Yadav, 2016). These benefits are usually communicated to consumers through mass media and impact consumer behaviour. George and Sunny (2021), Malik et al. (2019) and Prabhakaran et al. (2020) have analysed the relationship between PBs and adoption intention in the domain of mobile payments. Previous studies have assessed the direct impact of PBs on user intention to adopt. The present study adds to it by analysing the moderating role of PBs between perceived values and adoption intention. The association between perceived values and adoption intention would be stronger when PBs are high than when they are low, as users may give due consideration to PBs while adopting any payment method. Attractive cash back offers make users adopt m-wallets since it leads to saving of money. Therefore, we hypothesise:

**H12.** PBs moderate the relationship between perceived values and m-wallet adoption intention such that the association between perceived values and m-wallet adoption is stronger when PBs are high than when they are low.

Demographics are major moderators in the domain of technology.
adoption (Venkatesh et al., 2003). Gender differences could emerge from differences in psychology (Zhang et al., 2007). Prior studies showed that males consider online business activities to be less insecure than females do (Garbarino and Strailevitz, 2004). They perceive mobile commerce, internet banking and mobile banking more favourable, in comparison to women (Laukkanen and Pasanen, 2008). Shin (2009) outlined the significant moderating impact of gender regarding usage of technology. Chawla and Joshi (2020) came up with the finding that gender moderates the association between antecedents’ factors and attitudes. Key reasons for gender digital divide include digital skills, security and privacy concern, and perceived lack of relevance (Singh, 2017).

Likewise, age plays a vital role in impacting the relationship between perceived values and users’ adoption behaviour (Arning and Ziefle, 2007). Research in the area of technology adoption outlined that young customer behaves differently in comparison to old ones. Age is a key demographic variable that affects the adoption intention of technology (Chawla and Joshi, 2020; Venkatesh et al., 2003). Older people face barriers in the adoption of technology due to lack of interest, technophobia, lack of opportunity and training (Elena-Bucea, 2020). Young consumers have considerable experience with regard to the Internet and they provide importance to aspects like usefulness and perceived values. Literature assessed the association between age and users’ intention to adopt innovations like mobile banking and internet banking (Laukkanen, 2016).

Correspondingly, “education is a key predictor for the types of online activities that people engage in” (Elena-Bucea et al., 2020). Technology adoption may be affected by education (Munnukka, 2007; Singh et al., 2017). Education is positively related to ICT usage in both developing and developed countries (Nishijima et al., 2017). The lack of education and awareness about online financial transactions and the related benefits act as a major barrier in adoption of m-wallets (Sharma et al., 2018). Preceding studies in literature found that education positively impacts consumer’s willingness to adopt m-banking (Laukkanen et al., 2008) and internet services (Leong et al., 2020). Arif et al. (2020) outlined that higher level of education leads to lesser resistance towards m-wallet adoption among consumers. Chawla and Joshi (2017) assessed the moderating impact of education on attitude towards m-banking adoption. Studies examining the moderating impact of education are limited. Thus, the current study examined the moderating effect of education between perceived values and intention to adopt m-wallet. The following hypotheses can be extracted from the abovementioned discussion.

H13(a). Gender moderates the relationship between perceived values and m-wallet adoption intention, and the impact is higher for males.

H13(b). Age moderates the relationship between perceived values and m-wallet adoption intention, and the impact is higher for younger users.

H13(c). Education moderates the relationship between perceived values and m-wallet adoption intention, and the impact is higher for more educated users.

4. Research method

A hypothetic-deductive approach based on quantitative data has been employed to test the hypotheses. This approach has been popularly utilised in the social and management sciences, specifically in information system studies (Babones, 2015; Kamdjoug et al., 2021). Compared with other approaches, this approach generates more relevant results (Babones, 2015). It has been split into four parts: conceptual development, refinement of the conceptual framework, data collection, and data analyses and results (Kamdjoug et al., 2021). Fig. 2 presents the framework of the research methodology process.

4.1. Conceptual development

The research model has been developed based on literature review on electronic payments. Review of literature is essential as it assists in defining the scope of our study and developing a questionnaire. The questionnaire was developed using a research model, which includes constructs and corresponding items. Items have been measured on a five-point scale ranging from strongly disagree to strongly agree. The designed questionnaire was subjected to a pre-test. In the pre-test phase, questionnaires were distributed to users comprising two expert academicians, six working executives and seven customers; they were regular

| Conceptual Development | Refinement of the Conceptual Framework | Data Collection | Data Analysis and results |
|------------------------|--------------------------------------|----------------|--------------------------|
| Specifications         | Specifications                       | Specifications | Specifications           |
| (a) Literature review on electronic payments | (a) Pilot study | (a) Data collected through online survey | (a) Demographic analysis |
| (b) Literature review on adoption of m-wallets | (b) Reliability and accuracy verification | (b) Purposive sampling technique | (b) Confirmatory factor analysis |
| (c) Research model Development | (c) Modifications based on user feedback | (c) Measurement assessment with measurement model assessment. | (c) Measurement model assessment |
| (d) Questionnaire Development | | (d) Structural model assessment | (d) Structural model assessment |
| (e) Questionnaire pre-test analysis | | (e) PROCESS macro | (e) PROCESS macro |

Outcome

| Conceptual Development | Refinement of the Conceptual Framework | Data Collection | Data Analysis and results |
|------------------------|--------------------------------------|----------------|--------------------------|
| Specifications         | Specifications                       | Specifications | Specifications           |
| (a) Literature review on electronic payments | (a) Pilot study | (a) Data collected through online survey | (a) Demographic analysis |
| (b) Literature review on adoption of m-wallets | (b) Reliability and accuracy verification | (b) Purposive sampling technique | (b) Confirmatory factor analysis |
| (c) Research model Development | (c) Modifications based on user feedback | (c) Measurement assessment with measurement model assessment. | (c) Measurement model assessment |
| (d) Questionnaire Development | | (d) Structural model assessment | (d) Structural model assessment |
| (e) Questionnaire pre-test analysis | | (e) PROCESS macro | (e) PROCESS macro |

Outcome

(a) Proposed research model

(b) Primary Questionnaire

Outcome

(a) Final research model with 10 constructs and 30 items

(b) Data collection from 327 respondents through online survey

Outcome

(a) Findings of Measurement model

(b) Findings of PROCESS macro

Fig. 2. Research Methodology Process.
users of different m-wallets. The suggestions provided by the users were incorporated into the questionnaire. The final questionnaire comprised 30 items.

4.2. Refinement of the conceptual framework

After designing the research model and questionnaire, a pilot test was performed. It allowed researchers to check the adequacy of association between factors and ensure that there is no ambiguity for respondents (Kamdjoug et al., 2021). Authors verified whether each item measured the corresponding construct.

4.3. Data collection

An online survey was used to collect data. Purposive sampling has been employed to extract the required sample. Due to the pandemic, researchers designed an online survey. It was sent to people of different age, gender and educational levels through Microsoft forms and WhatsApp. The survey was administered in April 2021, when India was under lockdown and people were taking preventive measures against COVID-19. Respondents were apprised about the purpose of the study. A screening question was added to identify the respondents who were familiar with m-wallets, and items were redefined to make the questionnaire unambiguous. Only those who answered “yes” to the screening question were requested to fill in the rest of the questionnaire. A sample of 344 respondents filled up the questionnaires. 327 valid responses were utilised in the analysis. The target audience involved people who are above 18 years and familiar with m-wallet. Around 54 % of respondents were male. 45 % respondents belonged to age group of above 18 years and up to 30 years, 25 % were part of more than 30 years and up to 40 years, 24 % respondents formed the age group of more than 40 years and up to 50 years. Only 6 % respondents were above 50 years. Around 19 % of respondents had an annual income below Rs 3 lakhs, around 49 % had an annual income between Rs 3 lakhs and up to Rs 6 lakhs, and 32 % of users had an income above Rs 6 lakhs. In terms of education qualification, 11 % respondents were in the category of high school or below, 66 % were graduated and 23 % were post graduate and above. Further, 43 % respondents were existing users of m-wallet. An independent sample t-test was performed to examine the difference in the response between adopters and non-adopters. The results indicated that consumers’ responses are not different between adopters and non-adopters (t = 0.895, p greater than 0.05).

4.4. Data analysis and results

A two-step approach was employed to analyse the data (Anderson and Gerbing, 1988). First, the reliability and validity of the measurement scale was assessed by conducting the confirmatory factor analysis. Second, the structural equation modelling (SEM) using AMOS 24 was utilised to assess the direct hypotheses, and the PROCESS macro was used to validate the mediation and moderation hypotheses.

4.4.1. Measurement model

Table 1 shows the values of composite reliability (CR) and average variance extracted (AVE). The values of all constructs were found to be greater than the threshold level of above 0.7 for CR and above 0.5 for AVE. Factor loadings for all constructs were found significant ($p < 0.01$) and greater than the minimum threshold level of 0.7 on respective constructs, thereby confirming convergent validity of variables (Hair et al., 2010). Furthermore, Table 2 shows that the square root of AVE in the upper diagonal was found to be higher than the correlation coefficients of corresponding off-diagonal, representing discriminant validity of all constructs (Fornell and Larcker, 1981). Further, model fit indices demonstrated a good model fit ($\text{CMIN/DF} = 2.487$, $\text{GFI}$ (goodness-of-fit index) = 0.944, $\text{CFI}$ (comparative fit index) = 0.957, $\text{TLI}$ (Tucker-Lewis index) = 0.946, $\text{NFI}$ (normed fit index) = 0.941, $\text{RMSEA}$ adapted from Anshari et al. (2021); Jaiswal et al., (2021) ; Senalasari, Senali et al., (2021); Rafdinal and Senalasari, (2021); Senali et al., (2022)

Table 1 Measurement model assessment.

| Construct                      | Items                                      | Factor Loading | VIF  | Statements adapted from          |
|-------------------------------|--------------------------------------------|----------------|------|----------------------------------|
| Relative Advantage            | R1A: m-wallet facilitates me to accomplish | 0.834          | 1.291| Kaur et al., (2020); Mombeuil, and Ubed, (2021) |
|                               | transactions more quickly                  |                |      |                                  |
|                               | R1B: m-wallet is more efficient and        | 0.854          | 1.321|                                  |
|                               | effective than other electronic            |                |      |                                  |
|                               | payment systems                            |                |      |                                  |
|                               | R3A: Benefits of using m-wallet system     | 0.759          | 1.385|                                  |
|                               | outweigh its drawbacks                     |                |      |                                  |
| Ease of Effort                | EOE1: m-wallet is convenient to use        | 0.881          | 1.443| Rafdinal and Senalasari, (2021); Senali et al., (2022) |
|                               | EOE2: m-wallet has a user-friendly system  | 0.765          | 1.642|                                  |
|                               | EOE3: m-wallet saves a lot of time and     | 0.754          | 1.316|                                  |
|                               | mental efforts                             |                |      |                                  |
| Favourable                    | FC1: I have required resources and         | 0.721          | 1.273| Anshari et al. (2021) ; Jaiswal et al., (2022) |
| Infrastructure Conditions     | knowledge for utilizing m-wallets.         |                |      |                                  |
|                               | FC2: Specialized instruction regarding     | 0.733          | 1.348|                                  |
|                               | m-wallet usage is available to me          |                |      |                                  |
|                               | FC3: m-wallet is appropriate for me        | 0.943          | 1.213|                                  |
|                               | since it is                                |                |      |                                  |
|                               | compatible with other system used by me    | 0.731          | 1.802|                                  |
|                               | ST1: m-wallet service providers will never |                |      |                                  |
|                               | reveal my personal credentials to third    | 0.877          | 1.524| Chawla and Joshi, (2019); Williams, (2021) |
|                               | party                                      |                |      |                                  |
|                               | ST2: m-wallet service providers always     | 0.860          | 1.621|                                  |
|                               | fulfill their commitments                  |                |      |                                  |
|                               | ST3: m-wallet is a reliable app            | 0.812          | 1.646|                                  |
|                               | ST4: m-wallet has a security               | 0.738          | 1.612|                                  |
|                               | mechanism to deal with viruses and         |                |      |                                  |
|                               | hackers                                    |                |      |                                  |
|                               | ST5: I believe that my debit/credit        | 0.772          | 1.654|                                  |
|                               | card and bank accounts linked to           |                |      |                                  |
|                               | m-wallet will never be misused             |                |      |                                  |
|                               | ST6: I feel self-assured while performing   | 0.892          | 1.297| Shishah and Alhelaly (2021); Bradford (2021) |
|                               | transactions on m-wallet                  |                |      |                                  |
|                               | TT1: Touch-free transaction is            |                |      |                                  |
|                               | health-friendly as it reduces the risk     |                |      |                                  |
|                               | of getting infected from novel coronavirus |                |      |                                  |

(continued on next page)
(root mean square error of approximation) = 0.052) (Hair et al., 2010).

The variance inflation factor (VIF) was calculated to examine the presence of multi-collinearity. All VIF values have been presented in Table 1. The results indicated that the VIF values were below 3, suggesting that multi-collinearity is not an issue. Additionally, all correlation coefficients of the constructs in Table 2 were less than threshold value 0.9, thereby exhibiting that there is no multi-collinearity among the constructs.

### 4.4.2. Common method bias

To control the common method bias (CMB), authors used two statistical approaches. First, Harman’s one-factor test was performed to test the CMB (Podsakoff et al., 2003). It generated seven principal constructs, where the unrotated factor solution displays that the first factor represents only 26.35 % of variance, denoting that the CMB is less likely to occur. Second, a marker variable, which was unrelated with dependent and independent variables, was incorporated in the questionnaire (Malhotra et al., 2006). The correlation between the marker variable and all other variables used in the current study was very low. Thus, the CMB is not likely to be present in the data.

### 4.4.3. Hypothesis testing

SEM results demonstrated a good model fit (CMIN/DF = 2.373, GFI (goodness-of-fit index) = 0.956, CFI (comparative fit index) = 0.969, TLI (Tucker-Lewis index) = 0.958, NFI (normed fit index) = 0.953, RMSEA (root mean square error of approximation) = 0.046) (Hair et al., 2010). Hypotheses have been tested at three levels. For, hypotheses H1 to H5, direct effects have been tested. For hypotheses H6 to H10, mediating effects have been tested and, finally, for hypotheses H11, H12 and H13, the moderation effect has been tested. Results of the direct effect are exhibited in Table 3. Results revealed that relative advantage, favourable infrastructure conditions, security considerations and touch-free transactions have a positive significant impact on m-wallet adoption intention, and perceived values were found to have a positive significant effect on intention. Hence, H1, H3, H4 and H5 were supported. Ease of effort was found to have a non-significant impact on intention. Therefore, H2 was not supported.

Next, the mediation test was conducted using model 4 in the PROCESS macro. Bootstrapped bias-corrected confidence intervals (CIs) were performed for 5,000 re-samples with a 95 % confidence interval to examine the significance of mediation hypotheses (Cheung and Lau, 2008). The results for mediation analysis have been exhibited in Table 4. Results reported that the indirect effects of relative advantage, favourable infrastructure conditions, security considerations and touch-free transactions on m-wallet adoption intention were significant. These indirect effects were significant as confidence intervals for these effects do not cross the value of zero, although the indirect effect of ease of effort on m-wallet adoption intention was not significant. Therefore, perceived values mediate the association between all antecedents and m-wallet adoption except ease of effort. Hence, H6, H8, H9 and H10 were supported, and H7 was not supported.

Moderation tests were conducted using model 1 in the PROCESS macro by computing the interaction effect of moderator and independent variable. The result for moderation analysis has been reported in Table 5. It has been found that PCM, PBs and age moderate the association perceived values and m-wallet adoption intention since the confidence interval does not cross the value of zero, indicating the significant interaction effect (Hayes, 2017). The relationship between perceived values and intention was not significant. Therefore, perceived values and intention is moderated by age and the impact is higher for younger users than for older users (refer to Fig. 5). Thus, H11, H12 and H13 (b) were supported. However, gender and education were not found to moderate the association between perceived values and intention to adopt, rejecting H13 (a) and H13 (c).

### Table 1 (continued)

| Construct | Items | Factor Loading | VIF | Statements adapted from |
|-----------|-------|----------------|-----|-------------------------|
| Perceived Critical Mass | AVE = 0.706, CR = 0.876 | | | |
| PCM1: Many of my companions utilize m-wallet for making payment | 0.654 | 1.343 | Lew et al., (2020); George and Sunny, (2021) |
| PCM2: People in my friend circle use m-wallet quite often | 0.952 | 1.872 | |
| PCM3: Most people to whom I interact with, frequently use m-wallet | 0.984 | 1.834 | |
| Promotional Benefits | AVE = 0.723, CR = 0.891 | | | |
| PB1: M-wallets offer various discounts. | 0.892 | 1.512 | Malik et al., (2019); George and Sunny, (2021) |
| PB2: Over m-wallets, I get cash back after transactions. | 0.817 | 1.653 | |
| PB3: M-wallets offer more promotional benefits than any other payment method | 0.843 | 1.614 | |
| Perceived Values | AVE = 0.578, CR = 0.862 | | | |
| PV1: I perceive that learning and using m-wallet is quite straightforward | 0.723 | 1.874 | Madan and Yadav, (2016); Jeyarajakthy and Shankar (2021) |
| PV2: Paying bills, transferring money, recharge and shopping through m-wallet calls for minimal efforts | 0.780 | 2.217 | |
| M-Wallet Adoption Intention | AVE = 0.672, CR = 0.874 | | | |
| MA1: I would like to conduct transactions through m-wallet in near future | 0.845 | 1.578 | Singh et al., (2020); Shaw et al., (2022) |
| MA2: I would recommend m-wallet app to my colleagues and relatives | 0.862 | 1.504 | |
| MA3: I aspire to utilise m-wallet on regular basis | 0.799 | 1.295 | |

Source: The Author.
5. Discussion

The findings of the study suggested that relative advantage significantly influences users’ adoption intention towards m-wallet positively. This suggests that users give due importance to relative advantage provided by m-wallets over other payment modes. This finding agrees with the preceding studies (Mombeuil and Uhde, 2021; Zang and Mao, 2020). Our results suggest that users probably believe that their life will become simple by using m-wallets for making financial transactions, as it may eradicate the requirement of entering the complex process while doing financial transactions. Thus, m-wallet service providers must focus on offering more features and benefits that could be perceived as beneficial by customers in comparison to other conventional payment methods. Sincere efforts should also be made to market these features and benefits via social media and other platforms to cognitively position m-wallet in the mind of the user as a more productive technology that saves efforts and time. In accordance with the findings of previous studies (Chawla and Joshi, 2021; Jaiswal et al., 2022), results depicted a positive link between favourable infrastructure conditions and intention. This underlines the significance of support services and resources that are required for the smooth delivery of m-wallet services. Service providers must ensure that their applications must have information that informs customers regarding the availability of support services in case users encounter any issue while using m-wallet. It might involve free customer support service via email or live chat. Frequently asked questions also assist users in finding solutions to their problems. Furthermore, in accordance with the literature (Oliveira et al., 2014; Naranjo-Zolotov et al., 2019) the findings of the study suggested that facilitating conditions significantly enhances consumer adoption intention towards m-wallet. If consumers have infrastructural support to use
new technology, they tend to represent favourable intention towards it. In the current study context, due to mobile phone penetration and availability of Internet, consumers tend to represent positive intention towards m-wallet adoption for making payment. Our findings revealed a positive association between security considerations and intention. This conforms to the findings of previous studies in similar context (Chawla and Joshi, 2021; Shankar and Behl, 2021). The present study suggests that payment transactions hold users’ private information and, thus, the user seeks confidence that their data is safe, and the transaction is secure. Therefore, service providers must give due attention to ensure this. To strengthen security, service providers could incorporate pseudo-identity techniques and digital signatures within their apps. Findings also suggested that touch-free transaction significantly affect user intention towards m-wallet adoption. COVID-19 has offered users a compelling reason to use touchless payments. The post-pandemic world may see this as a new normal. Therefore, m-wallet service providers must highlight the benefits of contactless transactions in their promotion campaigns. This will help them in getting an edge over other payment mode. Further, contrary to the findings of previous studies (Patil, 2020; Senali et al., 2022), results suggested no positive association between ease of effort and intention. The probable reasons for the contrary findings could be because almost every service provider is emphasising on making e-payment modes convenient for their users. The rising penetration of smartphones and introduction of 4G internet connections have reduced issues like low bandwidth and small screen size, making it effortless for users to make payments. Moreover, most of the users are already equipped with required knowledge and confidence in using digital services. Therefore, users look for different aspects of services that are more important than simply convenience. Additionally, this study contributes to the existing literature by investigating the role of perceived values in the process of m-wallet adoption. In accordance with the findings of the studies in the other contexts (Shankar and Jain, 2021; Shankar, 2021), we found perceived values as crucial mediator. Findings showed support for mediating effect of perceived values for the relation between relative advantage, favourable infrastructure conditions, security considerations, touch-free transactions, and m-wallet adoption intention, whereas perceived values fail to act as a mediator between ease of effort and intention. Customer perceived values are the fundamental dimension for enhancing intention. It decides their propensity to utilise it. Ameliorating users’ values regarding m-wallet could help in
enhancing adoption. About moderating effects, the outcome revealed that PCM, PBs and age moderated the association between perceived values and m-wallet adoption intention. To the best of our knowledge, no study in the existing literature has examined the moderating role of PCM, PBs and age in the context of m-wallets. PCM can play a significant role in increasing m-wallet adoption among customers. This may create confidence in the mind of the consumer regarding m-wallets. It makes them believe that the people around them are using m-wallets. So, the more users observe and interact with others about m-wallets, the higher will be the probability of m-wallet adoption. PBs were found to moderate association between perceived values and user intention to adopt m-wallet. Many times, users choose to make payments via m-wallets against any other payment methods because of heavy incentives and rewards offered by m-wallets. Users get lured by additional discounts. Incentives could be provided in the form of freebies, multiple coupons and discount offers. It has been found that age significantly moderates the relationship between perceived values and intentions to adopt m-wallet, while gender and education fail to act as moderators. Age is a significant moderator as young consumers are more tech-savvy and technology friendly than older consumers. They are more interested in m-wallet usage as they prefer utilising it for recharge, shopping, money transfer and so on. It saves time and is consistent with their lifestyle. Gender does not turn out to be a moderator since gender differences are merely stereotypes. This is contradictory to the findings of previous studies (Riquelme and Rios, 2010; Zhang, 2005). The reason could be that smartphone ownership by women has gone up notably in low- and middle-income countries since 2014. It has risen by more than 250 million, with 80 % of women across these countries now owning smartphones and using them for making payments (GSMA, 2019). Due to the rising inclination towards technology adoption, awareness through marketing programmes and more ease of financial transaction, more millennial women have started using m-wallets. Likewise, education does not act as a moderator between perceived values and the intention to adopt m-wallet. This is also dissimilar to the findings of prior studies (Laukkanen and Pasanen, 2008; Munnukka, 2007). The current study uncovered the fact that most people these days use smartphones for different purposes. Those who know how to operate smartphones can easily use m-wallets because of a user-friendly design. Street vendors are not much educated but they utilise m-wallets for accepting payments and other transactions. M-wallet apps are simple to use and do not require any specific knowledge to perform financial transactions. Moreover, companies have deployed adequate resources on m-wallet education and training and multi-language options to make it easy to use even for less educated persons.

6. Theoretical contribution

This study theoretically contributes to the extant literature in several ways. First, studies related to m-wallet adoption intention in India are very limited. A comprehensive framework rarely exists in the extant literature to explore users’ m-wallet adoption intention during COVID-19. This study proposes a moderated-mediation framework for providing a deeper understanding of adoption intention in light of the ongoing pandemic. Second, the study, in its uniqueness, used the S—O—R theory as a theoretical support for the proposed model. In the literature, the S—O—R model has been utilised to explore the impact of environmental cues on consumer behaviour. The current study extends the application of the S—O—R model in the context of m-wallet adoption intention. Hence, it enriches the S—O—R model literature. Third, perceived values play a crucial role in predicting individual intention to adopt m-wallet. However, according to authors’ knowledge, no study has analysed the mediating role of perceived value in m-wallet adoption intention. This study contributes to the existing literature by examining the mediating effects of perceived values. Fourth, this study primarily contributed to the existing mobile payment literature by proposing and analysing the impact of various intervening variables like PCM, PBs and demographics (gender, age and education) as moderators between the association of perceived values and intention to adopt m-wallet. The overall findings of the study will enrich the understanding of m-wallet adoption intention among users and provide a framework for researchers to utilise such model to validate m-wallet adoption in other countries.

7. Practical implications

The proposed model will help practitioners in understanding the key dimensions and moderating effects of PCM, PBs and demographics (gender, age and education). As the relative advantage is found to have a significant influence on adoption intention, m-wallet service providers must focus on offering value-enhancing features and benefits that could be perceived as beneficial by customers in comparison to other conventional payment methods. Sincere efforts should also be made to market these features and benefits via social media and other platforms to cognitively position m-wallet as a more productive technology. To provide favourable infrastructure conditions, service providers must ensure that their wallet application must provide support services in real time. It might involve free customer support service via email, live chat or a phone call. Well-designed frequently asked questions can also assist users in finding solutions to their problems. To strengthen security, service providers could incorporate pseudo-identity techniques and digital signatures within their apps. To attain PCM, service providers should target early adopters and opinion leaders, and solicit their support in awareness campaigns. By this, potential users are likely to believe that people around them are using m-wallets. Extensive advertising through different media and encouraging communication by word of mouth and e-word of mouth could assist service providers in achieving critical mass. In the context of the outbreak of the current COVID-19 pandemic, m-wallet service providers can offer PBs through tie-up with various e-commerce platforms to get an edge over other modes of payment. Customers may be offered discounts and cashbacks while buying groceries, medicines and other products using m-wallets. Communication with senior citizens revealed that many of them find it tough to use payment apps, so m-wallet service providers may launch customised technology literacy programmes specifically designed for senior citizens to make them familiar with m-wallet features, benefits, and usages. Moreover, touch-free transactions proposed in this research should be promoted among users. Overall, this study offers insightful findings to financial service marketing, in general, and m-wallet literature in particular. It facilitates service providers in framing new strategies for enhancing m-wallet penetration.

8. Limitations and future scope

This study has certain limitations that could be addressed in future studies. First, this study uses only a quantitative approach. A mixed approach comprising both quantitative and qualitative aspects can be employed to obtain richer information. More mediators and moderators may be identified and their impact on the relationship may be studied. Second, this study considers both males and females, and covers users under various age categories. In the future, a study focusing on a single gender, or a particular age group may be conducted. Third, the same study can be performed in different domains like e-banking, m-commerce, mobile shopping and so on. It would be worth exploring whether the proposed model holds true in other technology domains. Further, due to limited time and resources, cross-sectional data have been used for this research. A study can be conducted using longitudinal data for finding some interesting aspects regarding m-wallet adoption among users as user behaviour might undergo transition with time. Thus, addressing these limitations may generate more theoretical and practical contributions. Finally, this study investigated consumers’ adoption intention towards m-wallet. In future, studies might investigate adoption behaviour and post-adoption response, such as satisfaction, loyalty
and commitment, for a deeper understanding of the phenomenon.

**CRediT authorship contribution**

**Ashwarya Kapoor:** Conceptualization, Data curation, Formal analysis, Methodology, Validation, Writing- original draft, Writing – review & editing. **Rajiv Sindwani:** Conceptualization, Formal analysis, Methodology, Validation, Supervision, Writing – review & editing. **Manisha Goel:** Conceptualization, Formal analysis, Methodology, Validation, Supervision, Writing – review & editing. **Amit Shankar:** Methodology, Supervision, Validation, Writing – review & editing.

**Declaration of Competing Interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

**Data availability**

The authors are unable or have chosen not to specify which data has been used.

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Ashwarya Kapoor received her bachelor’s and master’s degree from University of Delhi. Currently, she is pursuing PhD from J.C. Bose University of Science & Technology, YMCA, Faridabad, India. Her research interest is management of financial services. She has presented many papers in international conferences.

Dr Rajiv Sindwani holds PhD degree in the area of service quality management. Currently he is working in the Department of Management Studies at J.C. Bose University of Science & Technology, YMCA, Faridabad, India. He is having more than 15 years of experience in various sectors including consumer durables, banking and education. He has published many papers in reputed international journals and also presented papers in various international conferences.

Dr Manisha Goel holds an MBA and PhD degree. She has authored many papers in national and international journals. She guides research scholars at postgraduate and doctorate levels. With more than 13 years of teaching and research experience, currently she is working as Associate Professor in department of management studies at J.C. Bose University of Science & Technology, YMCA, Faridabad, India.

Dr Amit Shankar is an Assistant Professor in Marketing at Indian Institute of Management Visakhapatnam, India. His research interests are in the areas of retailing, services marketing, and mobile banking. Amit’s research has been published in the *International Journal of Hospitality Management*, *Journal of Business Research*, *Journal of Retailing and Consumer Services*, *Journal of Marketing Management*, *Marketing Intelligence & Planning*, *Journal of Bank Marketing*, *Journal of Strategic Marketing*, *Journal of Enterprise Information Management*, *Australasian Marketing Journal*, *Journal of Global Information Management*, among others.