

Adoption Intentions Of Unified Payment Interface (UPI): An Empirical Study Using Extended UTAUT2 With Trust, Interoperability, And Observability

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Abstract

In order to fulfil the demand for a smooth, effective, and inclusive payment system and to completely transform the digital payments environment, the Unified Payments Interface was established in India. UPI has registered 8,572 crore transactions in the current fiscal year as of December 11, 2023. It has been a major contributor to the rise of online payments in India, which represented 62% of these transactions in FY 2022–2023. Approximately 581 Indian banks were using the UPI as of April 2024. As of now, there fails to be a reliable study methodology for gauging user acceptance of UPI. Thus, this study presents a thorough analysis of recent research on consumers' intentions to use mobile and online payments and develops a novel model specifically for determining the adoption determinants of "Unified Payment Interface (UPI)". The model was presented in the paper by adding to the UTAUT2 model that was already in place by integrating, " Interoperability," " Observability," and " Perceived Trust " represent novel constructs. Further empirical testing of the suggested model may yield significant results and recommendations that help those who offer payment services make the right choices for the growth of their customer base.

Keywords- Unified Payment Interface (UPI), Mobile Payments, Extended UTAUT2 Model, Interoperability (IP), Observability (OB) and Perceived Trust (PT).

I. INTRODUCTION

In 2023, the mobile payment market in India was valued at US\$ 645.8 billion (imarc impactful insights, n.d.). Heightened even more by incidents such as the demonetization and the coronavirus. Digital payments are widely used in Indian daily life and have significantly altered the nation's consumer behaviour. Examples of these payments include using a credit card to book a hotel room, a debit card to purchase a new TV, and a mobile wallet to pay for veggies when out shopping (Rathore, 2023). The launch of Unified Payments Interface (UPI) by NPCI (which acts as a regulatory body for payments and settlement in India) in 2016 is a novel, convenient, real-time payment system that allows inter-financial institution transactions and allows more virtual payments adoption within the country. This demonstrates the remarkable expansion of the nation's UPI payments program, which saw around 74 billion transactions in 2022 (The economic times, 2024). As of November 2023, about 458 banks in India were live on the unified payment interface (UPI) (Statista, 2023). To facilitate the acceptance of remittances through the implementation of UPI, NPCI is currently engaged in negotiations with over 35 nations, for example, Bhutan, Singapore, and the United Arab Emirates currently provide UPI (Static PIB, n.d.). Whereas, Google Pay, Paytm, Phone Pe, Amazon Pay, and BHIM app are the leading UPI payment apps; in contrast, the UPI apps provided by banks themselves significantly behind these companies (National Payments Corporation of India, n.d.). There are well-established models for appreciating how users accept technological advancements created by various researchers. The popular frameworks for determining what aspects influence a technology innovation's adoption aim include Diffusions of Innovations (DOI) Theory of (Rogers, 1983), Technology Acceptance Model (TAM) of (Davis, 1989), Innovation Diffusion Theory (IDT) of E.M Rogers (1995), Unified Theory of Acceptance and Use of Technology (UTAUT) model of (Viswanath Venkatesh M. G., 2003), and Extended Unified

Theory of Acceptance and Use of Technology (UTAUT2) model of (Viswanath Venkatesh J. Y., 2012). These models are widely supported by the literature as a way of evaluating customer adoption of digital payments technology (Chun-Lung Chen, 2022); (S. K. Gupta, 2023); (Fahad, 2022). Although the TAM and UTAUT theories are dependable for pinpointing the several aspects that contribute to the acceptance of digital payments, these models are designed to evaluate the degree of technological adoption from an organizational perspective (Viswanath Venkatesh M. G., 2003). To address this shortcoming, the UTAUT2 (Viswanath Venkatesh J. Y., 2012) model—an expansion of the UTAUT (Viswanath Venkatesh M. G., 2003) model—identifies consumers' intentions about the use of a certain technological breakthrough. After doing an exhaustive review, the researcher discovered a vacuum in the literature: there is hardly a single theoretical model that analyses consumer adoption of the UPI, which has revolutionised digital payments in India. Thus, this study's objective is to offer a unique theoretical research model for examining the factors that influence adoption intentions of UPI, which is the real-time mobile payment system that has revolutionised virtual payments in India. The following research questions are the focus of this model's construction:

- Does the adoption of UPI by customers' behavioural intentions depend significantly on Observability (OB) and Interoperability (IP)?
- Is there any correlation between Perceived Trust (PT) support of UPI and its adoption behaviour compared to other digital payment mechanisms among consumers?
- How can the accessibility of Perceived Trust (PT) affect customers' Performance Expectancy, Effort Expectancy, and Hedonic Motivation when it comes to using UPI as a payment method?
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II. THEORETICAL REVIEW BACKGROUND

1. Unified Payment Interface (UPI)

The UPI, launched by the National Payments Corporation of India (NPCI) in 2016, In India, it is currently one of the most popular payment methods, with more than 43% of participants saying they choose UPI over other forms of payment. The main factors contributing to UPI's success were stated to be its simplicity, quickness, and security (World economic forum, 2023). This is accomplished by combining many bank accounts into a single mobile application, facilitating easy money transfers without disclosing any confidential data about the receiver such as Account number, IFSC Code, Bank name, Branch name, Account Holder name etc. Smartphone users may use a variety of UPI-based payment applications created by Payment Service Providers (PSPs) in their app stores that are concerned.

2. UTAUT Theory

By combining the components of eight widely used models, UTAUT theory introduces a single, unified model for measuring user adoption (Viswanath Venkatesh M. G., 2003). The purpose of this theory is to address the shortcomings of the eight current theories. The theories considered for this research were Theory of Reasoned Action (TRA) of (Martin Fishbein, 1975), The Social Cognitive Theory of (Bandura, 1986), Technology Acceptance Model of (Davis, 1989), The Model of PC Utilization of (Ronald L. Thompson, 1991), The Theory of Planned Behaviour of (Ajzen, 1991), The Motivational Model of (Fred D. Davis, 1992), The Innovation Diffusion Theory of E.M Rogers (1995). Three direct predictors of behavioural intention to embrace technology were identified by the study, which was carried out from an organizational perspective: performance expectancy (PE), effort expectancy (EE), and social influence (SI). It has been discovered that Use Behaviour is directly influenced by Facilitating Conditions (FC) (Viswanath Venkatesh M. G., 2003) One of the most popular models for assessing consumer acceptance of mobile payments is the UTAUT theory (Karrar Al-Saedi, 2019); (Ida Rosnidah, 2018). Prior studies on the acceptance of mobile payments discovered that Social Influence (Min-Fang Wei, 2021); (Pushp Patil, 2020); (Triasesiarta Nur, 2021) is the most important component, followed by Performance Expectancy (Karrar Al-Saedi M. A.-E., 2020); (Tushar Ranpariya); (Poulami Saha, 2022) , Effort Expectancy (Sandeep Kaur, 2022); (Dr. Sonal Purohit, 2022) and Facilitating Conditions (Sandeep Kaur, 2022); (Suha AlAwadhi, 2008). A new expanded model called UTAUT2 was presented by (Viswanath

Venkatesh J. Y., 2012) that incorporates the consumer context in order to get beyond the UTAUT model's shortcoming related to organizational context.

3. Extended UTAUT Model (UTAUT2)

Aiming to discover the decisive aspects of consumer acceptance towards a specific technology innovation from the consumer environment, the UTAUT2 (Viswanath Venkatesh J. Y., 2012) model is an extension of the UTAUT (Viswanath Venkatesh M. G., 2003) paradigm. Compared to 53 percent (Viswanath Venkatesh M. G., 2003) of previous technological adoption models, the UTAUT2 model explained 74% of the variance (Viswanath Venkatesh J. Y., 2012) in behaviour intention toward technology adoption. In addition to the prevalent UTAUT elements, the researcher proposed three novel constructs: Hedonic Motivation (Susan A. Brown, 2005), Price Value and Habit. Researchers employ UTAUT2 and its numerous extended and dependent models to determine and quantify the degree of consumer acceptance of different mobile payment methods (Giacomo Migliore, 2022); (Min-Fang Wei, 2021). In light of the fact that the Unified Payment Interface (UPI) is one of the ubiquities utilize digital payment channels in India (A, 2021), the UTAUT2 theory is therefore seen to be relevant for this research's examination of the adoption level of UPI.

III. CONCEPTUAL MODEL DEVELOPMENT AND RESEARCH HYPOTHESES

In addition to the current UTAUT2 constructions, the researcher suggests three more constructs to create an expanded UTAUT2 model. The components of the enlarged UTAUT2 model are as follows: Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Condition (FC), Hedonic Motivation, Price Value and Habit (Viswanath Venkatesh J. Y., 2012) and 'interoperability' (Sruthy S. Pillai, 2019), 'Observability' (Rogers E. M., 1983); (Fahad, 2022), and 'Perceived Trust' (Marisa Karsen, 2019); (Deepak Chawla, 2019); (Pushp Patila, 2020) as three recently built constructions.

A. Performance Expectancy (PE)

"Performance Expectancy in the organisational point of view is the degree to which an individual believes that the new innovative technology helps him/her to improve the current job performance." (Viswanath Venkatesh M. G., 2003). However, from the perspective of the customer "PE is the degree to which using the particular technology innovation provides benefits to consumers in performing the particular function" (Viswanath Venkatesh J. Y., 2012). PE construction is equivalent to Perceived Usefulness construct of Technology Acceptance Model (Davis, 1989). The PE concept is supported by existing literature, which also reveals a significant positive association between it and behavioural intentions to use digital payments (Deepak Chawla, 2019); (Dr. Sonal Purohit, 2022); (Karrar Al-Saedi M. A.-E., 2020). For digital payments, consumers are able to benefit from the Unified Payment Interface in their daily lives (A, 2021). As a result, it is crucial to include the PE variable while examining the adoption determinant of UPI and formulating hypotheses as follows:

H1: There is a significant positive relationship between Performance Expectancy (PE) and Behavioural Intention (BI) regarding consumer adoption of UPI.

B. Effort Expectancy (EE)

The definition of Effort Expectancy (EE) is "the degree of ease associated with the consumer's use of a particular innovative technology" (Viswanath Venkatesh J. Y., 2012). The EE factor is a similarity to the TAM theory's "Perceived Ease of Use" and "Ease of Use" elements (Davis, 1989). (Shivam Tripathi, 2020) the study discovered that customer opinions toward digital payment are influenced by several variables, including time savings, discounts and rebates, convenience, comprehensive records, lower chance of theft, watch your spending, and fostering a cashless economy. (Pushp Patil, 2020) also discovers a favourable correlation between EE and BI and proposes that digital payment providers have to ensure that their payment applications are both user-friendly and intuitive for their clients (Dr. Kratika Neema, 2016). The favourable relationship between the Behavioural Intention construct and the Effort Expectancy construct is further supported by studies such as (Sobti, 2019); (Joshi, 2024); (Chirag kumar

shah, 2023). Customers are naturally more likely to utilize any kind of technology if it requires less effort on their end (Chirag kumar shah, 2023) and the hypothesis that has been put out is:

H2: There is a significant positive relationship between Effort Expectancy (EE) and Behavioural Intention (BI) regarding consumer adoption of UPI.

C. Social Influence (SI)

Numerous models have examined social influence (Ajzen, 1991); (Viswanath Venkatesh J. Y., 2012). Social Influence is "the degree to which the individual perceives that important others believe they should use a particular new technology" (Viswanath Venkatesh M. G., 2003); (Viswanath Venkatesh J. Y., 2012). Asian communities are shifting their behaviour driven by a powerful social engine. Living in close-knit societies, they treasure social bonds and uphold cultural norms, which serve as catalysts for behavioural modifications (Eko Susanto, 2022). Based on the results, social influence has a significant positive impact on behavioural intentions; Friends and society have a greater effect on customers' decisions to use mobile payment systems (Lata Saini, 2023). Moreover, (Joshi, 2024); (Chirag kumar shah, 2023); (Tao Zhoua, 2010); (E. AbuShanab, 2007) have discovered a substantial relationship between SI and BI. Consequently, it is crucial to include the SI variable as a crucial component while researching the UPI adoption determinant and to make the following hypothesis:

H3: There is a significant positive relationship between Social Influence (SI) and Behavioural Intention (BI) regarding consumer adoption of UPI

D. Facilitating Conditions (FC)

Facilitating conditions are comparable to perceived behavioural control of Theory of planned behaviour and represent the impact of a user's expertise, abilities, and resources; from a consumer perspective, facilitating conditions are "the consumer's perceptions of the resources and support available to perform a behaviour" (Viswanath Venkatesh J. Y., 2012). According to (Chirag kumar shah, 2023); (Tao Zhoua, 2010) there is a strong relationship between the FC and BI's use of mobile payments. Thus, based on the previous premises, the following hypothesis can be developed:

H4: There is a significant positive relationship between Facilitating Conditions (FC) and Behavioural Intention (BI) regarding consumer adoption of UPI.

E. Hedonic Motivation (HM)

Hedonic motivation is the term coined to describe the "pleasure or delight people get from utilizing a certain technical advancement. It is mostly dependent on this pleasure component as to the degree that individuals embrace and stick with that technology" (Viswanath Venkatesh J. Y., 2012); (Chirag kumar shah, 2023). (Fahad, 2022) knowing the significance of the Unified Payment Interface paradigm for mobile payments in India. Hedonic motivation may play a significant role in influencing UPI adoption. The reality mentioned above allows for the development of the following hypothesis:

H5: There is a significant positive relationship between Hedonic Motivation (HM) and Behavioural Intention (BI) regarding consumer adoption of UPI

F. Price Value (PV)

According to UTAUT2 theory, price value is "the cognitive trade-off between the monetary cost of using them and the perceived benefits of the applications" (Ali Abdallah Alalwan, 2017); (Viswanath Venkatesh J. Y., 2012). Similarly, it is acknowledged that price value has a significant impact on whether or not Internet payment is adopted (Ali Abdallah Alalwan, 2017). The following theory might be developed as there is sufficient evidence in the literature to include Price Value as a determining factor of UPI adoption:

H6: There is a significant positive relationship between Price Value (PV) and Behavioural Intention (BI) regarding consumer adoption of UPI.

G. Habit (HT)

Habit is described as "the extent to which individuals tend to perform behaviours habitually because of learning" in the UTAUT theory of (Viswanath Venkatesh J. Y., 2012).11 research papers that charted

"habit" as a forerunner to behavioural intention reported significant outcomes related to technology utilization (Kuttamani Tamilmani, 2018). On the basis of the discussion above, the following hypothesis may be formed:

H7: There is a significant positive relationship between Habit (HT) and Behavioural Intention (BI) regarding consumer adoption of UPI.

H. Interoperability (IP)

Interoperability refers that, two cooperating software systems can function well together without requiring special interface work. It also entails forging connections and exchanging data and services across software programs, independent of the physical platforms (Mswahili, 2022). Interoperability is being aggressively included into retail payments by several nations, which has increased the usage of digital payments (Celene Ancalle, 2024). Interoperability had a strong favourable impact on consumers' behavioural intention to embrace UPI technology (Sruthy S. Pillai, 2019). The realization mentioned above allows for the development of the following hypothesis:

H8a: There is a significant positive relationship between Interoperability (IP) and Behavioural Intention (BI) regarding consumer adoption of UPI.

(Shivam Tripathi, 2020) according to this study, interoperability is essential for any significant technology to succeed. For retailers who had to register for many wallets in order to accept as many consumer payment options as possible, the interoperability of PPIs with UPI significantly lessened the burden (Aditi Bhatia-Kalluri, 2023). (Sruthy S. Pillai, 2019) in their study suggest that Perceived usefulness and ease of use are strongly positively impacted by interoperability, and these factors in turn affect consumers' behaviour intention to use mobile payment systems. Thus, based on the conversations above, the following hypotheses are:

H8b: There is a significant positive relationship between Interoperability (IP) and Performance Expectancy construct.

H8c: There is a significant positive relationship between Interoperability (IP) and Effort Expectancy construct.

I. Observability (OB)

The degree to which an invention is apparent to people inside a social system and that its advantages are simple to see and convey is referred to as its observability (Everett M. Rogers, 2003). (Fahad, 2022) The study suggests that mobile wallets, is perceived favourably, it can draw in additional customers and influence their willingness to use and recommend it to others. Whereas (Ibrahim M. Al-Jabri, 2012) the capacity to use financial services whenever you want, from anywhere, without having to wait in line, and to view the results of your mobile banking transactions right away are examples of observability. While (Fahad, 2022); (Maja Iskandar, 2020) findings highlighted the significance of observability in the influencing consumers' behavioural intention towards the adopting of Unified Payments Interface (UPI). Thus, the subsequent hypothesis is put forth:

H9a: There is a significant positive relationship between Observability (OB) and Behavioural Intention (BI) regarding consumer adoption of UPI.

Remarkably, observability was found to be a significantly indicator of small and medium-sized enterprises intents in China and Pakistan when it came to using mobile payment systems (Naseer Abbas Khan, 2021). Research by (Jiajun Jim Chen, 2005); (Jae Su Lim, 2012) also shown a significant relation between performance expectation and observability. Consequently, it is possible for observability to directly affect the performance expectation factor. The following theory is put forth:

H9b: There is a significant positive relationship between Observability (OB) and Performance Expectancy construct.

J. Perceived Trust (PT)

According to (David Gefen, 2003) the definition of trust can be, implementation of mobile banking may be defined as the accumulation of consumer beliefs regarding Integrity, Benevolence, and ability that may

increase the customer's readiness to rely on mobile banking in order to complete financial transactions and it promotes consumer commercial activity on the internet. Numerous studies have looked at trust and found that it plays a key role in determining how customers see and intend to use mobile banking (Arun Prasad G.S, 2021); (Ali A Alalwan, 2015); (Francisco Liébana-Cabanillas, 2020); (Ali Abdallah Alalwan, 2017); (Marisa Karsen, 2019). In their studies, (Ali Abdallah Alalwan, 2017) and (JI-HWAN LEE, 2013) provided empirical evidence that trust has a significant impact on both the customer's intention and performance expectation, (JI-HWAN LEE, 2013) effort expectation, and (Yujong Hwanga, 2006) Hedonic motivation. According to the current study and (David Gefen, 2003) proposal, trust may directly impact customers' intentions to use mobile banking or it may have an indirect effect by supporting the role of performance expectation and effort expectation in business intelligence. In light of there is sufficient research to support the inclusion of perceived trust in the adoption of UPI, the following hypothesis is put up in favour of the concept:

H10a: There is a significant positive relationship between Perceived Trust and Behavioural Intention (BI) regarding consumer adoption of UPI.

H10b: There is a significant positive relationship between Perceived Trust (PT) and Performance Expectancy construct.

H10c: There is a significant positive relationship between Perceived Trust (PT) and Effort Expectancy construct.

H10d: There is a significant positive relationship between Perceived Trust (PT) and Hedonic Motivation construct.

Building on the previous discussions, the researcher developed the expanded UTAUT2 model that is shown below with a view of defining the wide range of variables that support the behavioural intention to use UPI.

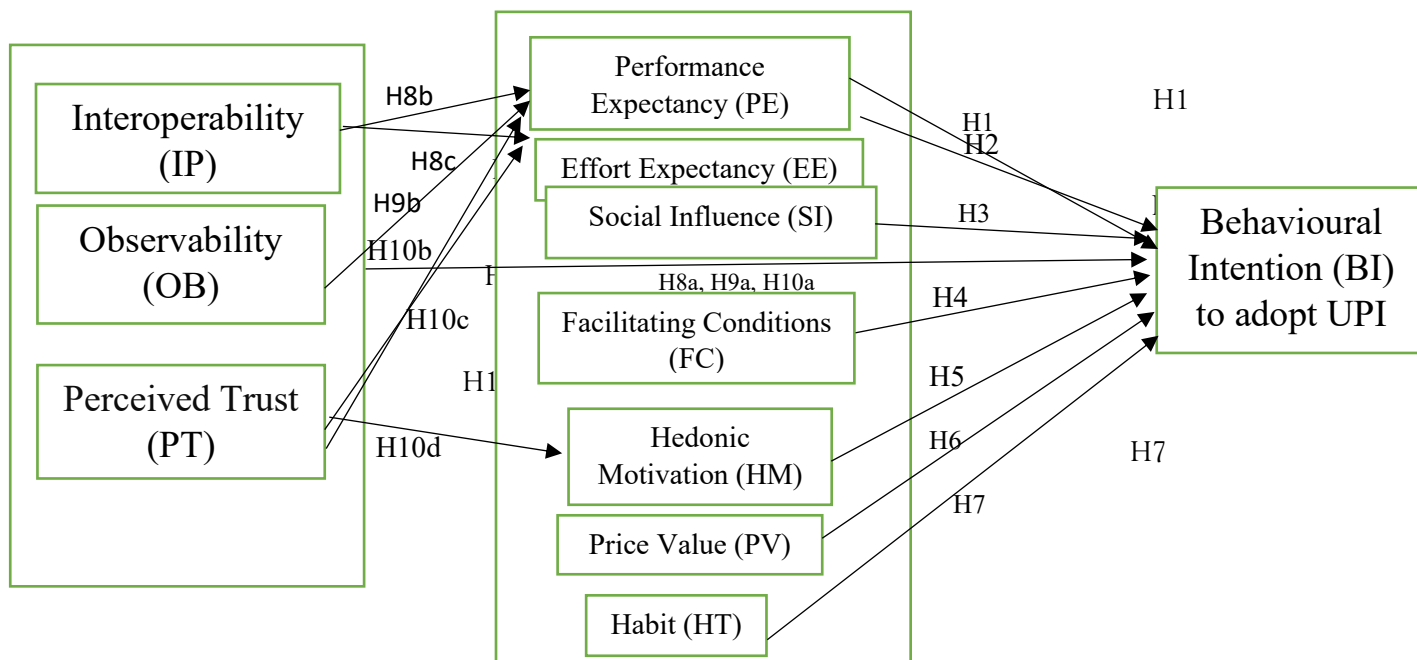


Figure I: Intention to Adopt Unified Payment Interface (UPI) Using the Extended UTAUT2 Model

IV. THEORETICAL AND MANAGERIAL CONTRIBUTIONS

Building a thorough theoretical framework that clarifies the factors impacting the adoption of the Unified Payment Interface (UPI) was the primary objective of this research project. Interestingly, the majority of the literature that is currently available discusses the adoption of mobile payments in general, with very little focus on UPI specifically. This study examines current adoption models for mobile payments in an effort to close this gap. After a thorough analysis, the UTAUT2 model proposed by (Viswanath Venkatesh J. Y., 2012) was shown to be the best framework for evaluating consumer propensity for UPI adoption. This work contributes to the present body of knowledge, extending the literature by finding three critical criteria that enhance the explanatory power of the UTAUT2 model in the context of UPI adoption: interoperability, observability, and perceived trust. This suggested model, which is poised to improve our comprehension of UPI adoption dynamics, is an elegant combination of proven concepts and fresh insights. It is possible that further empirical validation may produce useful information that will enable payment service providers to make decisions that will increase their user base and improve their products.

V. FUTURE RESEARCH DIRECTION AND LIMITATIONS

The telecommunications sector boom has led to a rise in the number of internet users in India, and more people are accessing the internet for mobile payment apps (Shivam Tripathi, 2020). Therefore, future studies should focus on incorporating the ideas and elements of other digital payment systems. The research model has only been built with retail users in view; manufacturers and merchants are not included in the study's scope. There is scope for more study in this field as manufacturers and merchants. The UPI has become more popular than cash transactions during the COVID-19 epidemic. Merchants, retailers, and other business stakeholders are using UPI as their preferred payment method more and more in response to the current conditions. As a result, this research takes on great importance since it might provide priceless future insights. The suggested approach is expected to produce significant findings after thorough empirical testing, providing payment providers with useful information. To put it simply, this research project has the potential to spur developments in the payment ecosystem and provide stakeholders the ability to effectively and confidently traverse the changing terrain.

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