“A mixed methods UTAUT2-based approach to understanding unified payments interface adoption among low-income users”

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A MIXED METHODS UTAUT2-BASED APPROACH TO UNDERSTANDING UNIFIED PAYMENTS INTERFACE ADOPTION AMONG LOW-INCOME USERS

Abstract

The Unified Payments Interface (UPI) represents a revolutionary advancement in mobile payment systems and has been primarily embraced by the middle and high-income segments of the Indian population. Its uptake among the low-income or those at the bottom-of-the-pyramid (BOP), characterized by individuals with an annual income less than USD 3,175, remains notably low, necessitating prompt investigation. This study endeavors to explore and validate contextual determinants influencing the development of behavioral intention to use UPI among BOP users. Under the mixed method approach, 26 interviews with active UPI users were conducted in the first phase. The collected data were subjected to deductive thematic analysis and the resulting factors were fused with the Extended Unified Theory of Acceptance and Use of Technology (UTAUT2) model to adapt it to the BOP requirements. In the second phase, responses from 423 potential UPI users were collected and scrutinized using structural equation modelling. The data analysis unveiled that the path coefficients for social influence (0.527), performance expectancy (0.242), perceived security risk (–0.166), knowledge (0.138), price value (0.123), facilitating conditions (0.119), and social benefits (0.096) were statistically significant in impacting user intentions. The model fit measures of the structural model fell within an acceptable range, and collectively, these factors elucidated 52% of the variance in behavioral intentions. It is recommended that marketers should leverage the interconnected nature of BOP communities to enhance awareness on functionality, subjective utility, social benefits, word-of-mouth, and security issues. This strategy aims to overcome barriers and boost UPI adoption among the BOP.

Keywords instant payment system, emerging economy, behavioral intention, technology adoption, sustainable financial inclusion.

JEL Classification G21, M10, M31, O33

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INTRODUCTION

In April 2016, the National Payment Corporation of India introduced a novel public payment system known as the 'Unified Payments Interface' (UPI), conceived with the vision of establishing a green, secure, efficient, accessible, inclusive, authorized, free, and one-click retail payment settlement mechanism in India. The widespread availability of smartphones and internet access, coupled with factors such as the demonetization of large currency denominations in 2016 and COVID-19-related restrictions, has propelled the increasing prominence of digital payment applications. UPI, specifically, has played a pivotal role in enabling widespread digital micro-payments, reaching a substantial volume of 2.2 billion transactions in December 2022, positioning India as a global leader in the expansion of real-time payment infrastructure (NPCI, 2023).

As mobile phones and internet access, prerequisites for UPI, become more affordable and accessible, a favorable environment is emerging

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for UPI to establish itself as a preferred digital platform in India, thereby contributing to the ongoing sustainable financial inclusion process. However, it is noteworthy that UPI has predominantly found acceptance among the urban population in India (Padaki, 2022). Given that the majority of the population in India and other developing countries belongs to the bottom of the pyramid (BOP), it becomes crucial to delve into the adoption process of UPI among BOP users. Exploring the factors influencing UPI adoption in the BOP population is particularly intriguing in light of these dynamics.

1. LITERATURE REVIEW

The implementation of the Unified Payments Interface (UPI) as a technological innovation in banking is a recent development for its stakeholders. It is imperative to understand the adoption process of UPI among Bottom of the Pyramid (BOP) users from the perspectives of researchers, the banking ecosystem, and governmental institutions. This study employs the extended Unified Theory of Acceptance and Use of Technology (UTAUT2) model proposed by Venkatesh et al. (2012) as the foundation for the conceptual model due to its comprehensiveness and applicability in diverse technology adoption settings (Tamilmani et al., 2018). UTAUT2 identifies seven factors influencing an individual's intention to use technology: performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit. The model has been successfully applied in various technological domains, including digital payments and mobile payment solutions (Gupta et al., 2022; Martinez & McAndrews, 2022).

This study specifically concentrates on technology adoption within the BOP segment, a classification based on an individual's annual income initially proposed by Prahalad and Hart (2002). The income cutoff for BOP has been revised by various authors and institutions; this study adopts McKinsey's (2007) suggestion of an upper cutoff income of INR 200,000 in Indian Rupees (equivalent to USD 3175) for the Indian consumer market as of 2015. The literature review delves into existing research on the identified factors to establish relationships and address gaps.

The initial factor, performance expectancy (PE), is characterized as "the degree to which using a technology will provide benefits to consumers in performing a certain activity" (Venkatesh et al., 2012). The factor hinges on the perceived utilitarian value that customers attribute to UPI. A literature review conducted by Patil et al. (2017) underscores the paramount role of technology usefulness-related factors in various technology adoption studies. Features such as swifter and cost-effective transactions, personalization, and seamless operational support emerge as crucial for consumers engaging in online transactions. Despite cash still holding sway in the financial ecosystem, UPI is witnessing a rising preference, especially for peer-to-peer transactions (Mahajan & Singla, 2017).

The likelihood of a technology gaining widespread adoption significantly increases when a technology perceived as useful is also perceived as easy to comprehend, learn, and use (Gupta & Arora, 2019; Patil et al., 2017). Effort expectancy (EE), the second factor in this study, is defined as "the degree of ease associated with the use of the system" (Venkatesh et al., 2012). According to a study by Pham and Ho (2015), EE emerges as a key driver of behavioral intentions, even surpassing the impact of performance expectancy. When users perceive a technology as easy to use, it enhances the likelihood of them developing adoption intentions, fostering a positive attitude and a quicker realization of its benefits (Jaiswal et al., 2022). Therefore, EE is anticipated to play a pivotal role for Bottom of the Pyramid (BOP) UPI users. Given their limited exposure to technology and understanding of financial products, grasping the application and utility of such products becomes challenging for them (Joshi et al., 2021).

The implementation of novel technologies faces challenges in the absence of essential prerequisites and support, leading to potential impediments over time. Venkatesh et al. (2012) proposed the term 'Facilitating conditions' (FC) and defined it as "the degree to which a person believes that the existing organizational and

technical infrastructure can support the use of technology." Literature review suggests that FC exerts a significant effect on the development of behavioral intentions to use mobile payment systems in India (Gupta & Arora, 2020) and other regions, such as Mozambique (Baptista & Oliveira, 2015), Taiwan (Tsai, 2021). However, some studies also suggest that FC may not have a substantial impact on adoption intentions (Martinez & McAndrews, 2022). Consequently, existing literature presents varied findings depending on the technology and the region or country under consideration. In the context of UPI, FC encompasses mobile devices, the mobile network, the availability of UPI applications, supporting UPI applications, and the grievance redressal mechanism established by regulatory bodies and banks. It is anticipated to play a crucial role in the UPI adoption process for BOP users due to the limited availability and development of facilities in this demographic.

Psychological characteristics and social interactions significantly influence individuals' intentions to adopt new technologies. Social influence (SI), an essential factor, is defined as "an individual's perception that the majority of the people important to him think that he should do or refrain from doing a specific behavior" (Fong & Wong, 2015). A person's actions are influenced by the people they trust, creating a perceived social pressure (Valtonen et al., 2015). This influence is particularly pronounced for BOP and rural populations due to their strong sense of community, influenced by cultural factors, limited skills, knowledge, and financial resources (Arnould & Mohr, 2005). Word-of-mouth, as noted by Kuada (2009), is another significant factor influencing this segment. Hence, an individual's intention to adopt new technology can be shaped by family, friends, co-workers, and social influencers. Studies on mobile payments in BOP segments conducted by Hussain et al. (2019) in Bangladesh and Hasan et al. (2019) in China underscore social influence as a significant factor.

Among the various attributes of UPI, its free-to-use interface for users particularly attracts BOP users due to their price sensitivity. The identified theme, 'Price value' (PV), perfectly captures this aspect. It refers to "consumers' cognitive trade-off between the perceived benefits of the applications and the monetary cost for using them" (Venkatesh et al., 2012). As customers personally bear the cost of adopting new technology, the cost-benefit analysis plays a crucial role in shaping behavioral intentions. UPI-integrated applications are freely available for download and use (Kakade & Veshne, 2017). Wong et al. (2015), in their study on m-advertising acceptance, suggested incorporating price value in future studies for a more comprehensive understanding of Behavioral Intention (BI). Other studies, such as Jamil (2014) on the adoption of more-than-voice services (MTV) in the BOP market of developing countries, have also identified price value as an important factor.

In the context of the adoption of digital technology, perceived security risk (PSR) plays a crucial role. It is defined as "the extent to which users believe that using a service may result in a potential loss of information or funds" (Lee & Song, 2013). According to A. Bhatt and S. Bhatt (2016), perceived security risk has been a significant impediment to the adoption of e-banking and mobile banking, posing a challenge not only for banks but also for online service providers. Studies from more developed countries, such as Chavali and Kumar (2018), indicate that respondents in the UAE do not perceive mobile banking as a security concern. However, in the BOP context, perceived security risk is expected to be relatively high due to low literacy, awareness, and income levels. Despite UPI being relatively secure compared to other digital payment methods, BOP users tend to perceive it as risky (Kakade & Veshne, 2017).

While performance expectancy primarily considers the personal benefits of using technology, this study identifies social benefits as a distinct factor. The BOP population is more socially engaged compared to other segments, and social benefits (SB), as per Rejikumar (2013), are defined as "the extent to which a person believes that adopting a new policy or application would impart benefits to society in general." Present-day users prefer products and technologies with minimal negative effects on the environment and society (Mishra & Sharma, 2010). UPI applications offer additional benefits such as improved financial literacy, financial inclu-

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sion (Rastogi et al., 2021), reduced corruption (Abidin et al., 2020), decreased transmission of pathogens and infections (Panwar et al., 2020), and an overall improvement in the economy's financial sector performance (Torki et al., 2020). Lower-income populations in developing nations often encounter bureaucratic obstacles in financial institutions, including unnecessary delays, extended processing times, and intricate processes (Sinha, 2021). UPI, as part of digitalization initiatives, is expected to act as a catalyst in overcoming bureaucratic challenges.

Knowledge (KN), defined as "respondents' general lack of knowledge regarding features of a new technology" (Eriksson et al., 2021), is also identified as a crucial factor in the UPI adoption process. Gupta et al. (2022) highlight in their study conducted in Norway that users with lower financial literacy face a higher risk of financial vulnerability when using digital payment methods. A significant portion of the population, especially in the young age group, remains unaware of the functionalities and features of UPI (Fahad & Shahid, 2022). Lack of consumer awareness was identified by Deloitte (2019) as a potential barrier to the adoption of mobile payments even in a developed economy such as Finland. Although awareness levels of UPI technology have increased post the COVID-19 pandemic, rural and low-income populations still lack awareness of UPI functionalities to a significant extent (Adhikary et al., 2021). In a developing economy like India, it can be expected that knowledge would influence the behavioral intentions of users to adopt UPI.

The Indian population has predominantly relied on cash transactions until recently, leading to ingrained experiences that contribute to a particular outcome and psychological inertia over time (Gao et al., 2020). Psychological inertia (PI) arises from repeated past behavior and is defined as "learned dispositions to repeat past responses" (Wood & Neal, 2007). Individuals tend to be mentally attached to previous outcomes, particularly traditional methods of transactions, partly due to habits and partly because of the transition cost in terms of the time and effort required to learn a new technology (Polites & Karahanna, 2012). Thus, developed psychological inertia acts as a barrier to the adoption process. Findings by Ahn and Nam (2022) suggest that mobile payment systems are associated with increased spending in users. Among BOP users, where income is lower and often seasonal, the inclination towards saving small amounts appears to be a viable strategy.

2. AIMS AND HYPOTHESES

The aim of this study is to identify and examine factors influencing the development of behavioral intentions to use UPI among BOP segment users. The following hypotheses are proposed in this regard (see Table 1).

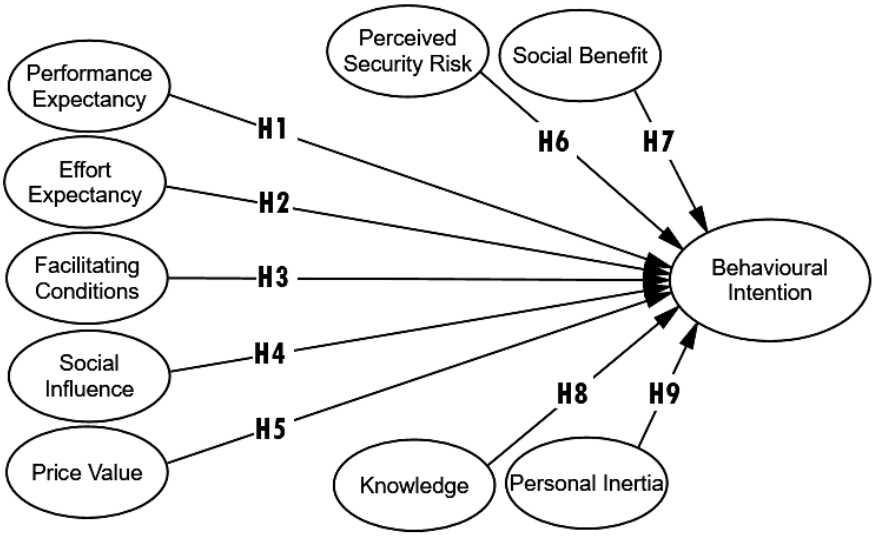

Figure 1. Proposed research model

Table 1. Hypotheses

No.	Hypotheses
H1	Performance expectancy positively affects behavioral intentions to use UPI
H2	Effort expectancy positively affects behavioral intentions to use UPI
H3	Facilitating conditions positively affects behavioral intentions to use UPI
H4	Social influence positively affects behavioral intentions to use UPI
H5	Price value positively affects behavioral intentions to use UPI
H6	Perceived security risk negatively affects behavioral intentions to use UPI
H7	Social benefit positively affects behavioral intentions to use UPI
H8	Knowledge positively affects behavioral intentions to use UPI
H9	Psychological inertia negatively affects behavioral intentions to use UPI

The identified relationships between the independent and the dependent variables are shown in Figure 1.

3. METHODS

This study uses a mixed method approach to expand and strengthen the results of the present study and contribute to the existing body of literature. The sequential exploratory design of this study followed a two-phase research journey. The first phase of qualitative analysis aided to explore new and relevant factors using data from telephonic interviews. The capability of qualitative data to provide new information and develop impactful perspectives on a phenomenon in its natural setting makes it valuable (Guercini, 2014).

Study prospects consisted of UPI users from the BOP segment, thus interviewing them over the phone using a semi-structured questionnaire helped to alleviate inhibitions and get to the core of the discussed topic. Interview slots were scheduled, and respondents were interviewed for 15-20 minutes in general. To derive maximum information from the interview, responsive interviewing methods developed by H. Rubin and I. Rubin (2012) was used. For this study, saturation was seemingly achieved after the first 26 interviews. Post interviews, audio files were manually transcribed into written form for performing thematic analysis.

Thematic Analysis: Qualitative data collected was processed for the thematic analysis, which is used to derive codes and themes through successive iterative comparisons (Braun & Clarke, 2012). Inductive and deductive techniques were used to arrive at codes and themes. The systematic process proposed by Braun and Clarke (2012) was used to perform thematic analysis. *The first step* includes studying the transcripts and allotting codes to similar category information and identifying tentative themes. In the *second step*, drafted findings were discussed with experts in the field. A few identified gaps were rectified, and final themes were identified. In *the third step*, the identified final themes were cross-checked with the transcripts to double-check the findings. *Lastly*, two product development managers of a renowned UPI application designing firm were contacted and their feedback on the reliability of the findings was invited (see Appendix A).

Instrument Development and data collection: The questionnaire for the study was divided into two sections. The first section included questions on respondents' demographic profiles, and the second section focused on measuring BOP users' intention to adopt UPI. Measurement items for the three new constructs, such as psychological inertia, social benefit, and knowledge, were designed by the author, and for remaining six constructs were taken from the previous studies. A five-point Likert scale was used to measure responses for each of the factors. Due to the large BOP population size, inaccessibility of sampling frames, a non-random convenience sampling technique was used for selecting respondents. The deterring effect of non-random sampling on result generalizability can be reduced to some extent by using homogenous convenience sampling (Jager et al., 2017). A pilot study was conducted with 15 participants for validating the framing of questions and minor changes were made as per the feedback. Respondents were approached and briefed about the purpose of the study and shortlisted based on their annual income and ownership of a smartphone. As per Malhotra and Dash (2014), the range of sample size from 300-500 is acceptable, thus questionnaire was forwarded to a slightly higher number, i.e., 550 UPI users, to compensate for non-respondents. 447 responses were received (response rate of 81.3%). The questionnaire was administered, and responses were collected using Google form.

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Data were cleaned and prepared for the analysis as the prelude to data analysis. Outliers were checked and rectified using Cook's distance and the Centred Leverage Value technique, and 24 identified outliers were discarded. A total of 423 respondents' data were finally considered for analysis. Normality concerns, Variation Inflation Factor and Kaiser-Meyer-Olkin values were also found to be in range (Hair et al., 2010). Procedural and statistical methods suggested by Podsakoff et al. (2003) were implemented to keep Common method bias in check. As a part of the procedural check, scale items were collected from different sources, and their serial order was randomized in the circulated form. To statistically check common method variance, Harman's single-factor test was performed, and the total variance extracted by a single factor was found to be 16.21%, which is lower than the recommended cut-off of 50% (Podsakoff et al., 2003). To achieve set objectives, a two-stage structural equation modelling was used, and the collected data were analyzed using Statistical Package for Social Sciences (SPSS) 25.0 and Analysis of Moment Structures (AMOS) 23.0 software.

4. RESULTS

Descriptive statistics for the demographic profiles of respondents from the first section of the questionnaire is summarized in Table 2.

Table 3 summarizes the Cronbach alpha values, Cronbach Alpha (α) if deleted, and factor loadings for all the scale items.

Factor loadings for all constructs ranged from 0.603 to 0.940, more than the cut-off value of 0.6, and present good internal consistency within scale items (Henseler et al., 2009). The measurement model's reliability and validity were assessed using confirmatory factor analysis. Table 4 summarizes the assessed composite reliability, average variance extracted values and correlation values for all the factors. The composite reliability and average variance extracted values for all constructs varied between 0.769 to 0.948 and 0.526 to 0.797, which as per Hair et al. (2010) are above the threshold values of 0.7 and 0.5, respectively, and indicate good reliability for all constructs.

Further, it was observed that the composite reliability values for all constructs were greater than average variance extracted values, and all constructs' average variance extracted values were greater than 0.5, confirming acceptable convergent validity (Henseler et al., 2009). For discriminant validity, Hair et al. (2010) suggested that the value of the square root of average variance extracted for a construct must be greater than the value of its correlations with other constructs. Additionally, the diagonal values in the corresponding columns

Table 2. Demographic profile of respondents

Item	Total	Frequency in Percentage
Gender		
Male	261	61.7%
Female	162	38.3%
Age		
18-35 years (young)	202	47.7%
36-55 years (middle)	125	29.6%
56 and above (old)	96	22.7%
Education		
Did not attend school	0	0%
Lower primary (age 6 to 10)	69	16.3%
Upper primary (age 13 to 15)	175	41.4%
Higher secondary (age 17 and 18)	124	29.3%
Graduate & above	55	13%
Annual Income (Indian Rupee)		
0-50,000	23	5.4%
50,000-1,00,000	152	35.9%
1,00,000-1,50,000	167	39.4%
1,50,000-2,00,000	82	19.3%

Note: n = 423.

Table 3. Cronbach alpha and factor loading results

Scale	No. of items	Scale item	Cronbach α	Cronbach α if deleted	Factor loading
Performance Expectancy (PE)	3	PE1	0.760	0.587	0.837
		PE2		0.595	0.851
		PE3		0.820	0.690
Effort Expectancy (EE)	4	EE1	0.854	0.793	0.843
		EE2		0.792	0.845
		EE3		0.838	0.781
		EE4		0.831	0.792
Facilitating Conditions (FC)	4	FC1	0.772	0.672	0.818
		FC2		0.692	0.815
		FC3		0.659	0.838
		FC4		0.798	0.603
Social Influence (SI)	3	SI1	0.891	0.844	0.864
		SI2		0.860	0.865
		SI3		0.831	0.888
Perceived Security Risk (PSR)	3	PSR1	0.900	0.849	0.915
		PSR3		0.84	0.908
		PSR3		0.882	0.887
Price Value (PV)	3	PV1	0.888	0.821	0.895
		PV2		0.795	0.920
		PV3		0.899	0.860
Social Benefits (SB)	5	SB1	0.947	0.931	0.892
		SB2		0.934	0.879
		SB3		0.931	0.900
		SB4		0.934	0.888
		SB5		0.941	0.860
Knowledge (KN)	3	KN1	0.889	0.827	0.909
		KN2		0.824	0.912
		KN3		0.875	0.878
Psychological Inertia (PI)	3	PI1	0.917	0.847	0.940
		PI2		0.863	0.939
		PI3		0.931	0.888
Behavioral Intention (BI)	3	BI1	0.768	0.700	0.736
		BI2		0.699	0.684
		BI3		0.667	0.834

and rows should be greater than the off-diagonal values (Henseler et al., 2009).

Measurement model fit measures were found to be in range and indicated good model fit. Chi-Square to Degree of Freedom Ratio ($\chi 2/df$) = 1.248, Goodness-of-Fit index (GFI) = 0.926, Comparative Fit Index (CFI) = 0.987, Tucker Lewis Index (TLI) = 0.984, Incremental Fit Index (IFI) = 0.987, Root Mean Square Error of Approximation (RMSEA) = 0.024, Standardized Root Mean Square Residual (SRMR) = 0.033.

Table 4. Reliability and validity measures for the measurement model

	CR	AVE	PE	EE	FC	SI	PSR	PV	KN	SB	PI	BI
PE	0.778	0.55	**0.741**	–	–	–	–	–	–	–	–	–
EE	0.855	0.600	0.143*	**0.774**	–	–	–	–	–	–	–	–
FC	0.798	0.573	0.077	0.126*	**0.757**	–	–	–	–	–	–	–
SI	0.891	0.733	0.268**	0.101†	0.115*	**0.856**	–	–	–	–	–	–
PSR	0.900	0.751	–0.097†	–0.069	–0.027	–0.07	**0.867**	–	–	–	–	–
PV	0.891	0.734	0.224**	0.032	0.01	0.179**	0.008	**0.857**	–	–	–	–
KN	0.891	0.732	0.046	0.093†	0.073	0.039	–0.006	0.125*	**0.856**	–	–	–
SB	0.948	0.784	0.297**	0.395**	0.060	0.185**	–0.177**	0.127*	0.072	**0.885**	–	–
PI	0.922	0.797	–0.092†	–0.071	–0.061	0.075	0.109*	–0.074	–0.019	–0.095†	**0.893**	–
BI	0.769	0.526	0.418**	0.164**	0.196**	0.600**	–0.220**	0.259**	0.182**	0.284**	–0.015	**0.725**

Note: Composite Reliability (CR), Average Variance Extracted (AVE), diagonal bold values represent square root of AVE values, significance of correlations: * $p < 0.050$, ** $p < 0.010$, *** $p < 0.001$ at 0.05 level.

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Table 5. Summary of hypotheses paths, expected sign, β value, p-value, and hypotheses status

Hypotheses	Path	β-Value	P Value	Status
H1	PE → BI	0.242	***	Accepted
H2	EE → BI	0.028	0.591	Not Accepted
H3	FC → BI	0.119	0.028	Accepted
H4	SI → BI	0.527	***	Accepted
H5	PV → BI	0.123	0.015	Accepted
H6	PSR → BI	– 0.166	0.001	Accepted
H7	SB → BI	0.096	0.046	Accepted
H8	KN → BI	0.138	0.007	Accepted
H9	PI → BI	0.011	0.824	Not Accepted

Note: *** p value < 0.001 at 0.05 level.

As measurement model parameters were found to be satisfactory, the study proceeded ahead with the structural model, which was tested for path coefficients and fit indices. Model fit index values were found to be within range as per Hu and Bentler (1999), suggesting data fits well in the proposed conceptual model ($\chi 2/df = 1.506$, GFI = 0.903, CFI = 0.974, TLI = 0.969, RMSEA = 0.033, SRMR = 0.078). Table 5 summarizes the results for the path coefficients and path relationships for set hypotheses.

The proposed model was found to be valid for understanding user intentions to use UPI in the BOP context. The coefficient of determination (R^2) for behavioral intentions was found to be 0.52, implying that 52% variance in behavioral intentions was collectively explained by the factors.

5. DISCUSSION

The intentions to use UPI in BOP users were found to be significantly affected by seven out of the nine identified factors. Social influence (β = 0.527) was found to have the most effect on intentions, meaning the decision making of BOP users is more influenced by social interactions and opinions of people around them. This confirms findings from mobile payment studies conducted in BOP markets by Hussain et al. (2019) and Hasan et al. (2019) in Bangladesh and China, respectively. The created social pressure can be understood as a combination of "social coercion, social imitation, and social normalization" (Chen & Sutano, 2007). Gupta and Arora (2020) claim social influence to be a weak predictor of intentions in urban regions of India in their study of mobile payment. This establishes the contrast and provides evidence that social influence indeed plays an important role in the BOP communities. Increasing rate of mobile phone, internet and social media penetration can be utilized to bolster social influence.

Performance expectancy (β = 0.242), an original UTAUT2 model construct was also found to be a significant factor. However, the degree of its effect was even lesser than half of social influence's effect on intentions. The fact that the utility related factor is relatively less but still significant in developing UPI adoption intentions in BOP users confirms the findings of Patil et al. (2017). Moreover, low awareness levels of UPI and its functionalities in the BOP masses along with limited digital and financial literacy may be a valid reason for performance expectancy's low value. When users perceive UPI to be less helpful in making their transactions-related tasks fast and easy, they are less likely to develop intentions to use UPI, this is another reason why social influence plays an even more important role in the BOP markets. This translates to saying that BOP users are not primarily adopting UPI because of its objective utility; they tend to get influenced from their circle in decision making.

Perceived security risk (β = –0.166) was found to have a negative but significant impact on BOP user intentions. Due to the BOP segment's socio-economic characteristics (Prahalad & Hart, 2002), UPI, a digital financial service platform, is often seen as a compromise to financial security. Perceived security risk in BOP users further gets aggravated by the prevalent traditional and electronic word-of-mouth publicity. The fact that people tend to believe negative information more quickly than positive (Hornik et al., 2015), causes

cases of fraud and thefts to overpower the benefits of technology. The present study's findings confirm the results of Thakur (2013) and counter the findings of Chavali and Kumar (2018).

Knowledge (β = 0.138) was also found to significantly affect intentions. Among BOP users, issues related to awareness, financial, and digital literacy were expected to crop due to their very limited exposure to technological developments. Some users think that financial literacy is a pre-requisite for UPI, however, a few respondents also highlighted the fact that once they started using UPI, their financial and digital literacy seemed to improve. The findings of this study corroborate the findings of Fahad and Shahid (2022) and Adhikary et al. (2021) who stated that low awareness about the functionality and features of digital payments is one of the major inhibitors in its adoption.

Another factor i.e., price value (β = 0.123), was also found to affect users' intentions significantly. The recent introduction of interchange fees for transactions made using prepaid payment instruments (NPCI, 2023) has raised concern amongst BOP users. Although, most users use bank account-to-account UPI transactions and will not be charged (NPCI, 2023), they are again concerned about the lack of clear information on BOP users. Overall, BOP users of UPI consider it to be cost-efficient and beneficial to use.

Facilitating conditions (β = 0.119) were also found to positively influence intentions, meaning the availability of the UPI setup, infrastructure, and support plays an important role in adopting UPI among BOP users. As facilitating conditions were identified as one of the important identified factors, an emphasis should be given on developing new strategic partnerships between UPI stakeholders, mobile phone, and telecom companies for developing stable mobile networks and grievance redressal mechanisms for UPI users. Third, awareness about UPI technology's features, working and grievance handling mechanisms should be improved, especially in low-income markets to improve the overall attractiveness of UPI. This confirms the findings of Baptista and Oliveira (2015) and Baishya and Samalia (2019) for smartphone adoption in the Indian BOP context. The findings, however, contradict those of Martinez and McAndrews (2022), who stated facilitating conditions to be insignificant in the adoption of mobile payments in the Unites States of America (USA). This difference can be attributed to the different economic conditions of the USA and India and the targeted users in the study.

Social benefits (β = 0.096) were found to positively affect intentions. However, the impact was found to be least amongst all significant factors. As per the conducted interviews, the social benefits of using new technologies after the COVID-19 pandemic and environmental concerns seem to have an impact on people. In the context of UPI adoption in a BOP setting, it can be noted that despite low or seasonal incomes and low literacy levels, BOP users of UPI showed significant concerns for its indirect benefits for them as well as the society. The findings of the present study confirm those of Rastogi et al. (2021) in UPI technology usage, and Moon et al. (2020) from carbon capture policy.

This study possesses certain limitations that can be the worked upon in future. First, the convenience sampling technique used in this study limits the generality of the findings to a specific subpopulation. Future studies may address this by refining the sampling technique to derive a more representative sample. Second, this study explored only direct relationships from the independent to the dependent variable. Other mediating and moderating relationships may be explored for improved understanding further.

CONCLUSION

Technological innovations such as the Unified Payment Interface (UPI) offer advantages across diverse segments of society. However, obtaining a nuanced comprehension of the determinants affecting adoption rates among financially vulnerable populations assumes paramount importance for strategically formulating a roadmap for subsequent governmental and financial institution interventions. This study employed qualitative exploration, specifically thematic analysis, among current UPI users to discern

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pertinent and context-specific factors. These identified factors were subsequently assimilated into the Extended Unified Theory of Acceptance and Use of Technology model to adapt it to the unique context of the Bottom of the Pyramid (BOP). The responses of prospective users were then subjected to empirical analysis. The findings underscore that, for BOP consumers, the influence exerted by peers, friends, and family members transcends the significance of the objective performance and utility of UPI. Consequently, it is recommended that UPI marketers channel their efforts towards leveraging the inherent interconnectedness within BOP communities. This can be achieved through targeted campaigns aimed at augmenting awareness of UPI functionalities, subjective utility, social benefits, addressing security concerns, and fostering positive word-of-mouth through actively engagement of local community or political leaders. Furthermore, the proposition is made to engage social media influencers possessing local, regional, and national appeal to enhance the efficacy of such campaigns. In developing economies, where mobile phones are perceived as a pathway out of poverty, the evolved UPI adoption model can serve as a strategic framework to bolster UPI adoption rates within BOP populations, thereby facilitating their integration into the broader economic landscape.

AUTHOR CONTRIBUTIONS

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Investigation: Rohit Joshi.
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APPENDIX A

Table A1. Thematic analysis results summarized in tabular format with two samples of illustrative quotes from respondents along with the first order quote and identified theme

Illustrative quotes	First order code	Theme
"UPI enables me to save time by not going to ATM every time for withdrawing cash"	Saves time	UPI usefulness
"I use UPI and it saves a lot of time by quickly transferring the funds"		
"UPI technology is very helpful as it helps in keeping a record of made transactions"	Effective record keeping	
"I can keep track of all the recent and old payments I made using UPI"		
"I find UPI applications safe as they use two levels of security"	Safe and reliable transactions	
"I need not share any details like a PIN or other codes with anyone while using UPI"		
"UPI helps me to pay any small or big amount without facing any issues related to change"	Financial performance	
"For me as a UPI user, the biggest advantage of UPI is that it is accepted almost everywhere with 24X7 operational"		
"I feel that setting up my account on the UPI application was indeed easy"	Easy to install and setup	Ease of using UPI
"With slight assistance, my father could easily install and set up the UPI application on this phone"		
"I strongly feel that an individual can learn to use UPI in very less time"	Learnable	
"UPI technology is relatively easy to use if we compare it with net banking and other modes of transactions"		
"I feel operating UPI applications is relatively easy"	Simple operation	
"As you try your hands on UPI applications, you realize that they are easy to operate"		
"I feel that using UPI applications in vernacular language makes it more acceptable"	Language Compatibility	Facilitating conditions
"UPI allows me to change the language options"		
"A few times network issues create error while using UPI application"	Network strength and internet speed	
"Availability of a proper 4G mobile network is must for properly operating UPI"		
"For UPI to work, a smartphone with working internet is required"	Device compatibility	
"I have a feature phone and until recently I could not use UPI"		
"I faced issues with UPI and was confused about how to resolve them"	Grievance handling mechanism	
"My biggest concern is that what will happen to their money if any issue arises while using UPI"		
"I use account-to-account UPI transfers most of the time with no charges"	Transaction cost	Price Value
"Recently UPI has started to apply nominal charges for transactions made from the wallet, they might extend it to all categories"		
"UPI applications are free to download and use, it is a good feature"	Free application download	
"Any application on which we use UPI is free to download from application stores"		
"I believe if I do not use UPI, I will miss out on the benefits of the latest technology"	Opportunity cost	
"Many people are earning cash backs and other coupons by using UPI"		
"I have heard from my peers about the utility of UPI technology"	Opinion Leaders/ Role model influence	Social influence
"I follow the government and my favorite youtubers' advice on new technology"		
"I downloaded UPI application as everyone in my family is using it nowadays"	Friends and family influence	
"After my friend was duped by some rogue people, I stopped using UPI"		
"I wonder what will happen to my UPI if my phone gets stolen or lost"	Device hacking/ Financial risk	Perceived security risk
"I do not use UPI as phone hacking is common nowadays"		
"I feel UPI is safe to use as I do not need to share my password or bank account number"	Concern for ID/ Password protection	
"Customers' information getting leaked makes UPI unsafe"		
"UPI's biggest benefit according to me is its ability to curb black money transfers"	authorized transactions	Social benefit
"All transactions made through UPI stay in record"		
"UPI has enabled a common man to avoid the bureaucracy faced in banks and other financial institutions"	Anti bureaucratic	
"It has been a long time since I waited in a queue in bank for transferring funds"		
"I had to learn how to operate a smartphone before I started using UPI on it"	Improves digital literacy	
"To keep my business running during COVID-19, I and many of my friends started using UPI technology"		
"UPI allows you to be at ease by not carrying cash while traveling in notorious areas or at odd times"	Fringe benefits	
"I feel safe if I do not have to carry cash in my bag/wallet while commuting"		
"Currency notes are carriers of infections. UPI usage would help in reducing currency notes exchange"	Health benefits	
"I started using UPI during COVID-19 and continuing with it"		

Table A1 (cont.). Thematic analysis results summarized in tabular format with two samples of illustrative quotes from respondents along with the first order quote and identified theme

Illustrative quotes	First order code	Theme
"I learned how to use UPI in a step-by-step manner"	Financial literacy	Knowledge
"I use UPI and I strongly believe that my financial literacy has improved"		
"Many people do not use UPI as they are still not aware of its features"	Awareness	
"I have the UPI application installed on my phone, but I am not aware of how I can use UPI"		
"I wish I could operate mobile phones so I could use the latest features that everyone is using"	Digital literacy	
"I am a digital nomad, and thus face challenges while using mobile phones"		
"Carrying cash is rather easy for me as compared to using digital payments"	Personal habits	Psychological Inertia
"I am habitual of using cash for all my transactions"		
"Making transactions in cash helps me save on small amounts whenever possible"	Inherent frugal nature of cash transactions	
"When I use UPI, I tend to spend more as compared to using cash"		

APPENDIX B

Table B1. Questionnaire items with sources

Constructs with their items	Sources
Performance Expectancy (PE)	
PE1: I find UPI useful	Venkatesh et al. (2012), Gupta and Arora (2020)
PE2: UPI usage enhances the effectiveness of my financial transactions	
PE3: UPI improves my financial performance	
Effort Expectancy (EE)	
EE1 UPI is simple and fast to use	Venkatesh et al. (2012), Gupta and Arora (2020)
EE2 Using UPI can easily be mastered	
EE3 Using UPI is easy for me	
EE4 Operating UPI is easy to learn	
Facilitating Conditions (FC)	
FC1: My smartphone has the required functionalities for using UPI	Venkatesh et al. (2012), Gupta and Arora (2020)
FC2: I can acquire the required knowledge for using UPI	
FC3: Helping assistance will be available in case of difficulty while using UPI	
FC4: I expect UPI to be compatible with other devices I use	
Social Influence (SI)	
SI1: People who matter to me suggested I use UPI	Venkatesh et al. (2012), Gupta and Arora (2020)
SI2: People who affect my behavior suggest I use UPI	
SI3: People whose opinions I consider valuable suggest I use UPI	
Perceived Security Risk (PSR)	
PSR1: Using UPI could allow other people or companies to access my personal information without my knowledge	Klobas et al. (2019)
PSR2: The security system built into UPI technology is not strong enough to protect my information	
PSR3: Hackers may take control of my information if I use UPI	
Price Value (PV)	
PV1: UPI is reasonably priced	Venkatesh et al. (2012)
PV2: UPI is a good value for the money	
PV3: At current transaction tariffs, UPI provides a good value	
Social Benefits (SB)	
SB1: I believe using UPI helps in curbing unauthorized transactions	Self
SB2: I believe using UPI helps to rectify bureaucracy in financial institutions	
SB3: I believe using UPI helps improve digital literacy	
SB4: I believe using UPI helps in reducing infections caused by currency notes exchange	
SB5: I believe using UPI improves financial literacy	

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Table B1 (cont.). Questionnaire items with sources

Constructs with their items	Sources
Behavioral Intention (BI)	
BI1: I intend to use UPI in the future.	Venkatesh et al. (2012); Gupta and Arora (2020)
BI2: I predict I would use UPI regularly	
BI3: I plan to use UPI in the coming year.	
Knowledge (KN)	
KN1: I believe financial literacy is a must for using UPI safely	Self
KN2: I believe awareness about UPI and its features is necessary for using it properly	
KN3: I believe digital literacy is necessary for using UPI	
Psychological Inertia (PI)	
PI1: I would continue to use my traditional methods of transactions as I am more used to them	Self
PI2: Using traditional methods of carrying out transactions helps me to save trivial amounts	
PI3: UPI usage leads to increased spending due to its increasing acceptability	