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Adoption of mobile payment among visually impaired users in Tamil Nadu based on technology acceptance model (TAM)

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Abstract--This study employed a technology acceptance model to determine the adoption of mobile payment among visually impaired users in Tamil Nadu. After the pandemic, India pushed to the virtual world. Digital payment plays a vital role in the virtual world. At the same time visually, impaired users also adopt the digital culture to upgrade themselves in the virtual world. This study reveals the influencing factor toward the adoption of mobile payment and the visually impaired user-friendly payment application. In this study, the researcher used snowball sampling and the telephonic interview method for data collection. Based on a previous study researchers derive five factors to evaluate the adoption of mobile payment, there are perceived usefulness, perceived ease of use, perceived trust, intention to use mobile payment, and adoption use mobile payment. This study totally covered 18 districts in Tamil Nadu, a study conducted between February and March 2022. A researcher contacted 56 respondents but only 50 were interested to participate in the interview. This study found that ease of use is the most influencing component toward the adoption of mobile payment among visually impaired users.

Keywords--adoption of mobile payment, technology acceptance model, ease of use, digital payment, visually impaired users.

Introduction

The technology acceptance model (TAM) outlines two primary factors that influence people's attitudes and intentions toward new technology: how they use it and how easy it is to use. TAM is a paradigm for examining the early phases of user acceptance of new technologies. It is used to research computer adoption among users. Later on, the extension of the technology acceptance model had been developed to study the adoption of new technology. TAM was supported by a previous study and they proved this model is suitable for analyzing the adoption behavior of the electronic payment users (Raida & Néji, 2013). This study investigated the adoption of mobile payment systems among visually impaired users in Tamil Nadu employed by TAM.

According to WHO, 2.2 billion visually impaired people are around the world. Visually impaired users wish to do their work on their own. Especially when comes to cash transactions, such as bill payments and digital transactions. A new trend technology is available for doing a transaction with the support of mobile applications. Digital payment is cheaper, faster, easier, and safer while transactions have taken between buyer and seller (Yang et al., 2021). During the pandemic situation, online services have been increased and digital payment is turned into a trustworthy one, thus the physical mode of transaction and long-distance transaction problem has been removed by an electronic payment system (Yang et al., 2021). National payment corporation of India (NPCI) did research on "Digital payment adoption in India, 2020" in that research they found that 79% of Indian households are using third-party payment applications for digital payment transactions such as Paytm, PhonePe, and Google pay. Growth of internet and electronic payment in India, in the CLSA report they have pointed out the internet growth and electronic payment adoption by Indians, UPI is the dominant payment system in India due to the penetration of smartphones and affordable internet services made the digital payment from 61 billion to 300 billion by 2021 (Sunainaa Chadha, 2021).

Mobile payments in India

In India as per the India digital payment report Q3 2021, 54% of the UPI transactions were done for P2P (Person-to-person) and 46% of UPI transactions done for P2M (Person-to Merchant). As per the RBI-Digital payment index (DPI) 2021, 30.19% growth in digital payments in India. E-commerce platforms such as Flipkart and Amazon are recorded by 90% of UPI-based transactions. Small Kirana shops, vegetable, and grocery stores had started accepting contactless payment. Nowadays one smartphone with a good internet connection is enough to do the shopping and traveling.

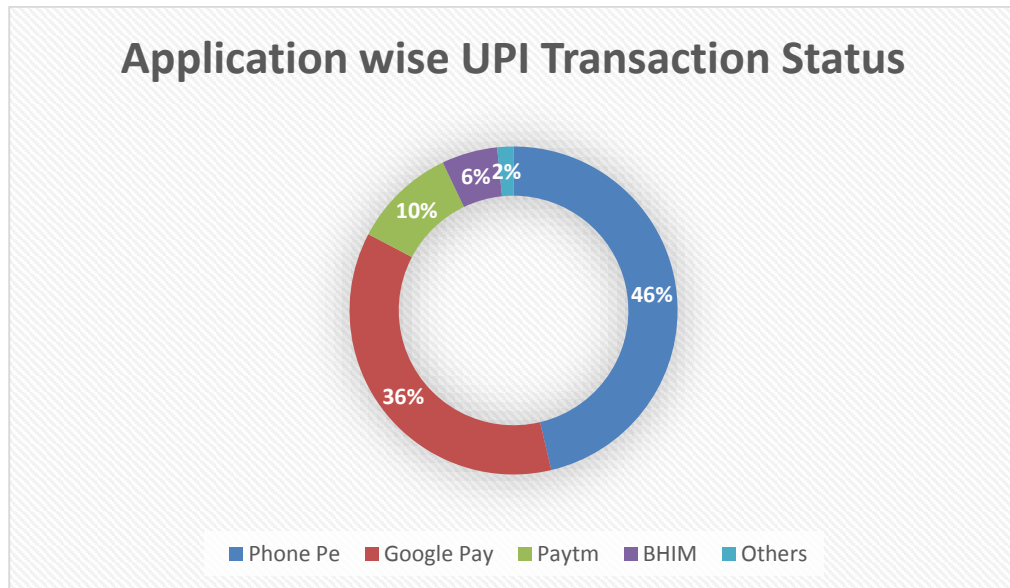


Figure 1. 2021 UPI Transaction status
Source: The Times of India

Unified Payment Interface (UPI)

National payment corporation of India (NPCI) which is behind UPI. UPI aims to reduce the use of paperwork in payment and provide a safe and simple digital payment system. UPI provides Indian people with several services like instant money transfers, peer-to-peer transactions, person to merchant transactions, and barcode payments with a secured virtual identity. The cost of transactions is low in UPI. By July 2022 instant low-cost fund transfers between Singapore and India will be linked. Singapore's Pay Now and India's UPI will allow direct transfer between bank accounts. To enable fund transfer via mobile number, virtual payment address between two countries.

TAM

TAM is a term coined by "Davis" in 1989 to describe how users adopt new technologies. which is influenced by the benefits and usefulness of the technology(Davis, 1989). benefits This model is used to study the positive and negative approaches toward new technology among the users. This model was cited in several studies and tested by various statistical tools(Raida & Néji, 2013)

Review of literature Adoption

"Perceived ease of use" and "Perceived usefulness" influence the urban user's intention to adopt mobile technology, age and gender are moderating factors in rural India towards mobile technology(Gupta & Jain, 2015). Innovativeness is the key factor for mobile internet users and there is no influence on the ease to handle the internet, therefore update is very important to increase the usage of

the internet in Arabia (Alalwan et al., 2018). In the future young generation will adopt the electronic wallet because new technology is easy to adopt for the youngster (Balakrishnan & Shuib, 2021). When comparing the urban and rural areas, internet accessibility is very low in rural areas. Accessibility is a crucial factor in the acceptance of new technology, and the same is applicable for “mobile banking” adoption such as incomplete internet facilities affecting the usage of mobile banking in a rural areas (Zhu et al., 2021). Technology affordances and constraints theory was used to examine the future usage and in India, there is a plan to adopt mobile payments, the outcome of the survey reveals that convenience and easy access influence the user to continue the usage but on the other side users have fear of security breach (Pal et al., 2021). Adoption of mobile banking among rural people was influenced by economic factors and trust, if it is affordable people will start using mobile banking but the earnings of the rural farmer are very low therefore adoption is influenced by an economic factor (Tobbin, 2012). Trust and social factors play a vital role in consumer experience in mobile banking (Shahid et al., 2022)

Satisfaction

Online banking service and customer satisfaction has a positive influence by education qualification and increasing internet usage lead to the intention to use online banking (Sambaombe & Phiri, 2022) Adoption of electronic banking is influenced by an understanding of the technology, when it is easy to understand the methods and it intent the user to use it again and again (Liaw & Huang, 2003) In-depth interview had been conducted among 23 respondent to study the interpersonal relationship in peer to peer payments, thus the study explores that social network integrated with payment creates social pressure on privacy, Example: what’s app payment (Li et al., 2021).

Conceptual Framework Perceived Usefulness (PU)

PU describes the benefit due to implementing this technology in the workplace, and how this technology helps to complete the work on time without any hassle. PU has been shown to have a good impact on the desire to utilise E-Payment (Giashe Liu & Pham Tan Tai, 2016). When the user is considering the technology is useful for completing the task, the rate of adoption of that technology is also increasing (Crabbe et al., 2009)

Perceived ease of use (PEU)

When users view a piece of technology to be simple to use, it is more likely to be accepted and adopted (Lederer et al., 2000). Ease of use refers to free of effort, thus requiring minimum effort to complete the task (Davis, 1989) User-friendly technologies encourage the adoption of new technology among the users (Owusu et al., 2021),

Perceived Trust (PT)

Trust in using digital payment is developed by a strong, secure, transparent infrastructure provided by the digital payment service provider (Chawla & Joshi, 2020). Working on reducing the risk would increase the trust in the technology (Akturan & Tezcan, 2012). Privacy and free of security threats are the important components of trust, when the technology is fulfilling those components successfully will result in the adoption of technology (Sarika & Vasantha, 2018)

Intention to use Mobile payment (IUMP)

The intention is the intermediate factor for adopting the new technology (Bagozzi, 1981). The simplicity of use and utility of the new technology impact the intention to employ it for day-to-day life (Amoako-Gyampah & Salam, 2004). The intention would be different based on the cultural factor (Malhotra & McCort, 2001)

Adoption of Mobile payment (AOMP)

The adoption of mobile banking is influenced by the culture (Bankole et al., 2011). The convenience of accessibility and usage paves the way for the intention to adopt (Crabbe et al., 2009; Shankar & Rishi, 2020). India is heading toward a cashless economy for this person of the nation should adopt the cashless transaction, when the digital payment system is comfortable to use this leads to achieving the target of a cashless economy. when the technology is easy to use and secure to use, then the user will easily adopt the technology (Alkhowaiter, 2020)

Research Methodology

Data Collection

The research was carried out between February – and March 2022. In 2021 censuses were not conducted in India due to a national pandemic, so the visually impaired population in India is unknown, therefore this study used snowball sampling for data collection. From one respondent the researcher gets another visually impaired respondent's contact number for data collection. Since the study's target respondents are visually impaired therefore the researcher uses the telephonic interview method for collecting data. The interview was conducted among mobile payment users in Tamil Nadu. Between February and March 2022, the researcher contacted 56 respondents, and 50 mobile payment users were eligible and interested to participate in the interview.

Area of the study

The study was conducted in Tamil Nadu. Participants from 18 districts had been part of the study. Of that 22% of participants were from Chennai and Madurai districts, 6% of participants from Chengalpattu, Tiruvannamalai, Namakkal, and Vellore districts, 4% of participants from Kanchipuram, thoothukudi, Karur, and

Pudukkottai district, and 2% of participants from Tiruvallur, Dharmapuri, Nagapattinam, Villupuram, Theni, Dindigul, Ranipet and Coimbatore.

Measurement and scale

Twenty-five Scales employed in this study were derived from a previous study. Four scales for PU, five scales for PEU & PT, and four scales for intention to use were derived from “Cashless Transactions: A Study on Intention and Adoption of e-Wallets” and “user acceptance of mobile payment: the effects of user-centric security, system characteristics and gender”(Lwoga & Lwoga, 2017; Yang et al., 2021). One scale for intention to use was adopted from “Examining consumers’ usage intention of contactless payment systems”(Karjaluoto et al., 2019). One scale for adoption was derived from “Cashless Transactions: A Study on Intention and Adoption of e-Wallets” (Yang et al., 2021).

Data analysis Method

In this study, the researcher used path analysis for finding the causal relationship between the dependent variable and independent variable. And this study used the “Mann Whitney U test” to test the significance between gender and factor toward the adoption of mobile payment among visually impaired users and “The Friedman test” for testing the highest influencing factor towards adoption of digital payment among visually impaired users.

Demography profile

Table 1
Demography profile of visually impaired mobile payment users

MEASURABLE VARIABLE	ITEMS	Frequency	PERCENTAGE
AGE	19-25 Years	5	10%
	26-30 Years	30	60%
	Above 30	15	30%
	Total	50	100%
Gender	Female	8	16%
	Male	42	84%
	Total	50	100%
Education Qualification	UG	6	12%
	PG	42	84%
	Professional	2	4%
	Total	50	100%
Occupation	Student	12	24%
	Government employee	18	36%
	Private employee	19	38%
	Self-employee	1	20%
	Total	50	100%
Income level	“Below 1 lakh”	25	50%
	“1lakh To 2 lakhs”	6	12%

	"2lakhs To 3 lakhs"	10	20%
	"Above 3 lakhs"	9	18%
	Total	50	100%
Marital Status	Single	39	78%
	Married	11	22%
	Total	50	100%
Level of visual impairment	100% Blind	35	70%
	Low vision	15	30%
	Total	50	100%

(Data from primary sources)

It is obvious from the table above that the majority of the study's respondents are men, they fall between 26-30 years, they are postgraduates working as private employees and their income is below one lakh.

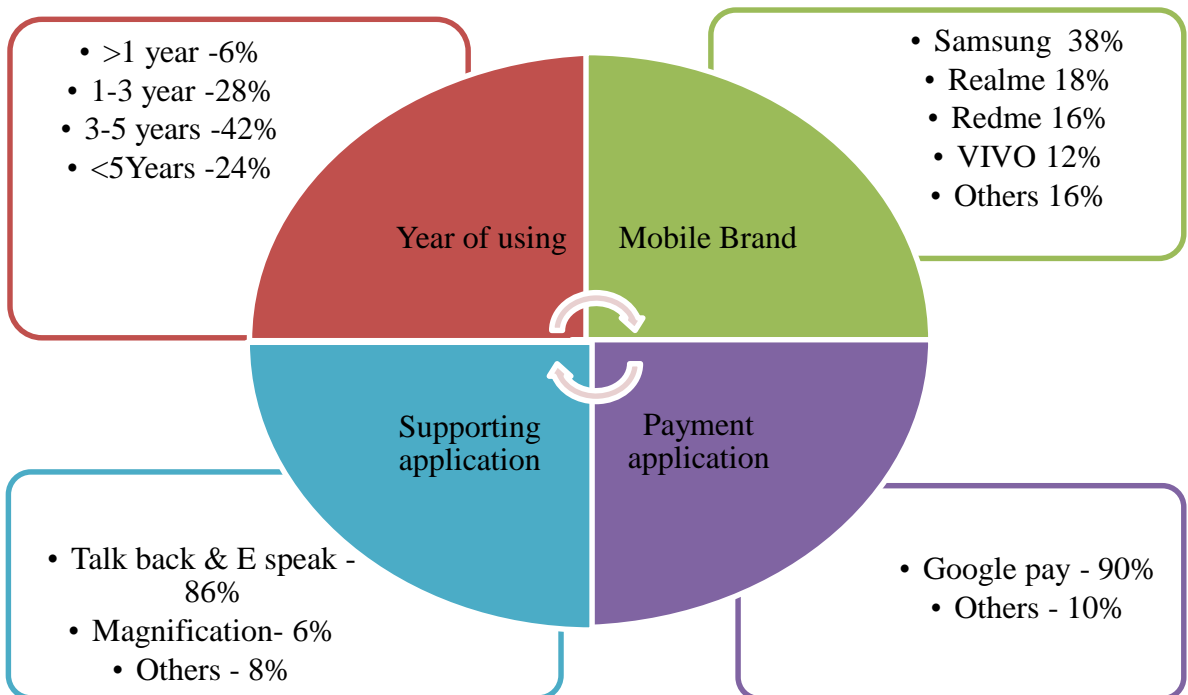


Figure 2. Mobile Payment usage

The above fig.2 diagram describes the mobile payment usage details of visually impaired users, the study found that majority of the users are using google pay, for five years and they using Samsung mobile with the support of talkback, E-speak, and magnification. The study also found that Google pay is users friendly for visually impaired users when compared to other payment applications.

Reliability of the scale

The reliability of the scale is determined using Cronbach's alpha (CA)

Table 2
Reliability test

Reliability Statistics	
Cronbach's Alpha	N of Items
0.701	25

The study used Cronbach's alpha to evaluate the reliability of the variables, CA value greater than 0.06 are acceptable. The CA value is 0.701, as shown in the table above, hence it is acceptable. In this study three exogenous variables and two endogenous variables, five variables there are "Perceived Ease of Use", "Perceived Trust", "Perceived Usefulness", "Intention to Use", and "Adoption of Mobile Payment". Each variable consists of five measuring scales, the CA value for the entire 25 measuring scales is above 0.06. Therefore, the variable for the study was verified.

Path analysis

Table 3
Variable Classification

Observed, exogenous variables	Observed, endogenous variables	Unobserved, exogenous variables
"Perceived Ease of Use"	"Intention to Use Mobile payment"	e1
"Perceived Trust"	"Adoption of Mobile payment"	e2
"Perceived Usefulness"		

Table 4
Variable counts

variables in the model:	7
observed variables:	5
unobserved variables:	2
exogenous variables:	5
endogenous variables:	2

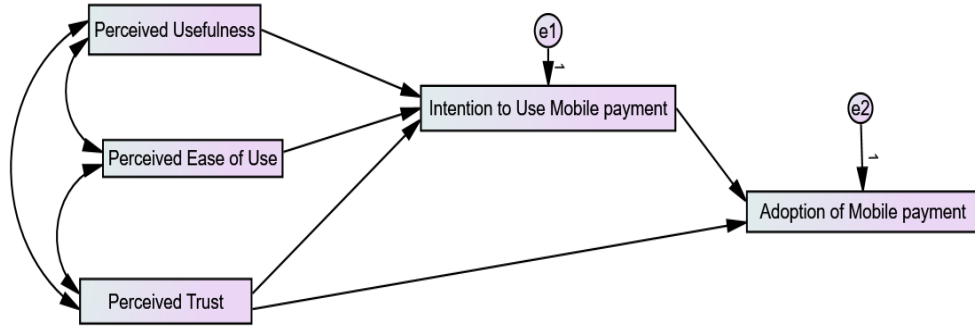


Figure 3. Proposed Model

Based on the review the researcher frames the proposed model, that user desire to use and adapt to mobile payment is influenced by “Perceived Usefulness”, “Perceived Ease of Use”, and “Perceived Trust”.

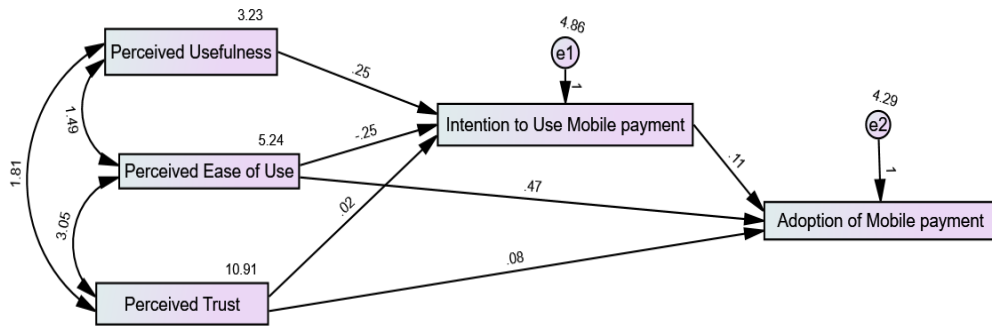


Figure 4. Proved Model

According to the above-proven methodology, “Perceived ease of use” and “Perceived Trust” have a direct impact on visually impaired users' adoption of mobile payment.

“*H₀₁: There is no influence on the adoption of mobile payment among visually impaired users*”

Table 5
Path analysis Regression weight

endogenous variables	Path	exogenous variables	Estimate	S.E.	C.R.	P
IUMP	←	PEU	.247	.156	1.581	.114
IUMP	←	PT	.018	.106	.167	.867
IUMP	←	PU	.248	.191	1.295	.195
AOMP	←	IUMP	.107	.132	.812	.417
AOMP	←	PT	.077	.098	.782	.434
AOMP	←	PEU	.469	.143	3.268	.001

(Source: Amos Output)

When perceived ease of use increases by one, mobile payment uptake increases by 0.469. The standard error of the regression weight estimate, 0.469, is roughly 0.143. It's less than 0.001 chance of reaching a crucial ratio as large as 3.268 in absolute value. As a result, at the 0.001 level, the regression weight for perceived ease of use in the prediction of visually impaired consumers adopting mobile payment is substantially different from zero. As a result, at a 1% level of significance, the null hypothesis is rejected. It is obvious from the above regression table that visually impaired users are adopting mobile payment because it is easy to use and they don't need anyone's help to initiate the transaction. When compared to a traditional cash transaction, mobile payment is easy for visually impaired users as it is easy to use.

Table 6
Correlations of covariance

Covariance	Path	Covariance	Estimate
PEU	↔	PU	.361
PEU	↔	PT	.403
PT	↔	PU	.304

(Source: Amos Output)

36.1% (0.361) is the estimated correlation between “perceived ease of use”, 40% (0.403) is the estimated correlation between perceived ease of use and perceived trust, and 30% (0.304) is the estimated correlation between perceived trust and perceived usefulness. Hence ease of use and trust are highly correlated covariance toward the adoption of digital payment among visually impaired users.

Table 7
Variances Estimate

	Estimate	S. E	C.R	P-value
PEU	5.238	1.058	4.950	<0.001
PT	10.912	2.205	4.950	<0.001
PU	3.230	.653	4.950	<0.001
e1	4.859	.982	4.950	<0.001
e2	4.285	.866	4.950	<0.001

(Source: Amos Output)

From the above table, it is clear that ease of use, trust, and usefulness is significantly different from zero at the 0.001 level.

Hypothesis

“Null hypothesis: The hypothesized model has a good fit”

“Alternate hypothesis: The hypothesized model does not have a good fit”

Table 8
Model fit summary

Parameters	Suggested value	Research Model value
P-Value	Greater than 0.05	0.803
Chi-Square	Greater than 0.01	0.062
G.F. Index	Greater than 0.9	0.999
A.G.F. Index	Greater than 0.9	0.992
CF Index	Greater than 0.9	1.00
RMSEA	Less than 0.06	<0.001

(Source: Amos output)

The determined P-value is 0.803, which is larger than 0.05, indicating a perfect fit, according to the preceding table. It is an excellent fit because the goodness of fit index (GFI) value (0.999) and adjusted goodness of fit index (AGFI) value (0.992) are both larger than 0.9. The determined comparative fit index (CFI) value (1) indicates a perfect match, and the root mean square error of approximation (RMSEA) value is less than 0.001, indicating that the model is perfectly fit. Hence the null hypothesis is accepted.

Significant between Gender and factors toward Adoption of digital payment.

“H₀₂ There is no significant difference between the mean rank of gender concerning the adoption of digital payment among visually impaired users”

Table 9

“Mann Whitney U test for significant difference between the mean rank of gender concerning factors towards adoption of digital payment among visually impaired users”

Factors towards adoption of digital payment	Gender		Z value	P-value
	Male	Female		
Perceived Usefulness	24.91	28.56	0.65	0.5
Perceived Ease of Use	24.29	31.81	1.36	0.17
Perceived Trust	23.71	34.87	2.00	0.04*
Intention to Use Mobile payment	25.60	24.93	0.12	0.9
Adoption of Mobile payment	23.90	33.87	1.78	0.07

Note:1. * At a 5% level, this indicates significance

The null hypothesis is rejected at a 5% level of significance since the P-value is less than 0.05. As a result, there is a considerable variation in the mean rank of gender when it comes to digital payment uptake among visually impaired users. Male users are more likely to use mobile payment, according to the average rank, followed by ease of use. And female users are influenced by their trust in the payment application followed by ease of use.

Significant among factors toward digital payment

“H₀₃ There is no significant difference among the mean ranks of factors toward digital payment”

Table 10
“Friedman test for significant difference among mean ranks of factors toward digital payment”

factors towards digital payment	Mean Rank	Chi-Square value	P-value
PU	4.27	69.58	0.001**
PEU	3.46		
PT	1.93		
IUMP	2.52		
AOMP	2.82		

Note: 1. **At a 1% level, this indicates significance

The null hypothesis is rejected at a 5% level of significance since the P-value is less than 0.05. As a result, there is a considerable variation in the mean rank of gender when it comes to digital payment uptake among visually impaired users. Male users are more likely to use mobile payment, according to the average rank, followed by ease of use.

Discussion, Limitation and Recommendation

Discussion

This study aims to analyze the adoption of mobile payment among visually impaired (VI) users in Tamil Nadu based on the technology acceptance model. This study explored the influencing factor for adopting mobile payment among VI users. This study proved that the ease-of-use factor of mobile applications made them adopt mobile payment. This finding has the potential for improving the accessibility of payment applications for visually impaired users. Ease of use encourages the users to continue the digital payment transaction (Talwar et al., 2020). The current study examines the significance between gender and influencing factors, in that study found male users are influenced by the ease of use and usefulness whereas women users are influenced by trust components. These findings also support the previous study on building trust through implementing a new policy (Chakraborty et al., 2022).

Limitations

The study's limitations are that Few VI users refused to participate in an interview. And this study represents a small group of respondents. This study explored the experience of mobile-based payment applications alone. This study is based on TAM with five constructs, therefore in future research additional constructs and models might be included to examine VI user experiences. This study was limited to a few districts only in the future it should extend all over India.

Recommendation

The visually impaired younger generation is eager to learn new technology. They are ready to learn Mobile banking and mobile payment application with the support of smartphones with E speak. This study reveals that google pay and phone pay are user-friendly applications for visually challenged users so they use these payment applications as an alternative mode of payment. Therefore, the study suggests that banks add easy-to-use features for VI users while designing the mobile payment application. Mobile banking will also reduce the cost of banking when compared to traditional face-to-face branch banking(Crabbe et al., 2009). During the interview, a few respondents share their opinion about the mobile payment application, the reward, voucher, and cashback option is not accessible for VI users. After the successful transaction, the payment application would be credited with cashback or voucher to the user's reward basket, a normal-sited user can easily earn those rewards and cashback but it is difficult for VI users to earn the rewards even though it's credited to the reward basket. This study recommended giving notifications for rewards and it should be accessible for VI users. The next recommendation of this study is QR code scanning, it is easy for VI users to initiate the transaction by using phone number, UPI ID, and bank transfer option whereas QR code scanning is not easy for them to initiate the transaction, here the challenge is to scan the QR code correctly through the mobile camera. Since a QR code is a label and it is not easy to find the code by simply touching the label if it is an embedded QR code and it is easy to touch and feel. Therefore, this study recommended designing the QR code with an embedded label that is easily accessible for visually impaired users.

Conclusion

Penetration of smartphones and affordable internet connections pave the digital platform for transactions and it replaces debit and credit card payments. Digital payment has the potential to fulfill the goal of digital financial inclusion in India. At the same time, there is a divide in digital financial accessibility in India. Visually impaired are wish to Access digital payment applications without third party help. They prefer the application which required minimum effort to initiate the transaction. In this digital era, every bank has its mobile payment application but that application is not user-friendly for visually impaired users. Finally, they push to use third-party payment applications such as google pay and phone pay. If the third-party payment application can provide accessibility for VI users, then why these banks can't provide this accessibility for their clients? This is the divide in digital financial accessibility in India. The hard-earned money is locked up in one place because of a lack of accessibility. Still, few visually impaired users are visiting their bank to withdraw their money, this scenario needs to change.

Declaration of competing interest

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Credit authorship contribution statement

Ms. Parvathy V: Conceptualization, investigation, and writing – original draft.

Dr.D. Durairaj: Supervision, validation and Writing – Review & editing.

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