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Unified Payments Interface use for Digital Financial Inclusion in Towns

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Abstract
Penetration of digital banking through unified payment interface (UPI) services is studied in the current study on a small town Kuppam in Andhra Pradesh, India for the empirical data collected through a self-administered questionnaire and applying statistical tools such as bivariate correlation and relationship assessment and found that digital transactions (DT) are used by individuals and feel that these DT have brought ease of transacting along with tracking facility. Results reveal that demographic factors doesn't have any relationship with the use of UPI services and the same is confirmed in bivariate correlation analysis on DT. A relationship map is drawn to find out whether individuals understand monitoring and regulatory agencies guidelines, privacy norms that safeguard their interests and found that people are aware about guidelines and follow them at regular time intervals to update their knowledge and rights, but lot more needs to be done by the monitoring and regulatory agencies in gaining momentum in digital financial inclusion targets set by central and state governments to bank the unbanked areas across India. This study is helpful for diversified stakeholders like academicians, researchers, policy makers in analyzing the penetration of digital banking in small towns there by helping banks and UPI service provides in formulating strategies of boosting awareness about DT importance. This study, also helps banks in identifying movement of DT based on which privacy related decisions can be made, establish relationship with clearing houses and service providers for quality and speedy transactions.

Keywords: Bivariate Correlation, COVID, Digital Banking, Digital Financial Technologies, Digital Transactions, Digital Wallet, Relationship Map.

1. Introduction

Digital financial inclusion (DFI) is the order of transactions by individuals and business entities due to advancements in technology supported by privacy and security concerns and policy maker's inclination towards digitalization processes. One big help that COVID-19 pandemic made to the mankind is teaching the need for technology integration into the day to day banking activities, irrespective of geographical or business boundaries [1]. Informal economies are no exception to the digital transformation in day-to-day transactions, with increased mobile telecommunication network integration that helped in payments and receipts easy for all the stakeholders involved [2] [3]. This mechanism helped policy makers as well in

keeping track of the money flow in the market, such that necessary actions can be taken for improving the quality of digital payment interface by empowering them with appropriate policy decisions paving way for an indirect means of financial inclusion which compels individuals to possess a bank account [4] [5] [6].

The widespread use of mobile phones and internet technology helped rural residents accessing banking services easily from their homes, further contributed by introduction of digital wallets and minimizing digital transactions (DT) processing charges has further increased the need for a bank account which the banks have utilized through their promotional network, where not only banking, but also the allied services like insurance have been promoted, which contributes to the effective understanding of technology acceptance model (TAM) among varied segments of population [7], [8].

Internet use by individuals as well as by merchants has helped in digitalization of banking services which helped in the introduction of mobile banking services in the later time periods [9]. As of June, 2025 India has 1170.88 million subscribers using wireless network out of a total of 1218.36 million total telecom subscribers and the rest being the wired (47.49 million) also, there are 979.71 million internet and 944.12 million broadband service subscribers that are registered as on the said day [10]. India's telephone density is estimated at 133.72 per cent in urban region, 59.19 per cent in rural segments and an overall 85.69 per cent across [10], which offers enough opportunity to the companies still to tap the untapped rural market to fill the gap. Hence, the current research work is considered by the researchers as apt.

Digital financial adoption and use are one of the easy means of transacting for daily needs to bulk volume transactions of individuals in a safer manner, through internet or mobile banking technology adoption by the banking companies [11]. Due to the adoption of digital banking, the number of transactions increased worldwide that helped economies to grow at a faster pace than the present paving way for increased trade relations, thereby enhanced monitoring and regulatory framework [12] [13], including the informal economic activities for which households are using mobile banking that increases financial inclusion [2] [14] not only among individuals, organized business entities but also for the benefit of greengrocers and gig workers [2].

In rural regions, the adoption and use of digital banking technology usually observed to be nominal or lacking due to the wide spread awareness of technology use among bank customers, apart from network quality of internet services by the providers effecting the DFI process in the developing economies [15], [16]. Technology adoption and implementation by banks along with the central bank of the country's initiatives on the financial literacy programs has increased the pace of financial inclusion, use of electronic and mobile banking, opening of banking service franchisees in rural regions, which helped in self-employment generation opportunities among youth which helped in easing the banking activities including increment in credit offered by banks there by reducing the branch footfall [17]. The advent of information and communication technologies (ICTs) adoption has solved the digital divided to a greater extent, but still it prevails in certain pockets due to the nature of employment including the migrant workforce, geographic divide, financial literacy rate among users of services, socio-psychological conditions prevailing and so on [18]. FinTech has shown solution for a greater number of problems experienced by banking industry in working on financial inclusion process, through internet of things (IoT), robo-advisory services and through the use of blockchain technology [19]. Use of FinTech had

addressed service quality of banks through the integration of models such as TAM and E-S-QUAL, which yielded positive results in finding out the user experience due to the technology interface in their day to day money transactions [20] [21].

2. Review of Literature

In the digital financial technologies (DFT), the use of blockchain and DeFi technologies platforms help individuals to choose their operations freely apart from the customized autonomous digital platform experience that helps mitigate the fraudulent practices with safeguards at each level of a transaction along with confidentiality [7] [22] [23]. This assures clients of their data privacy, completing transactions at a faster pace with accuracy that brings efficiency in transactions [24]. Some banks have even used DFT for branchless financial transactions use with wide spread online connectivity, through mobile banking, internet banking, partner channels and UPI services [17] [25].

Financial inclusion has been playing greater role in the money market for decades, and this needs the help of technology to drive it more smoothly and successfully for a greater good. Financial tripod [6], [26] designed by researchers covers financial literacy and stability leads to financial inclusion and when the technology joins hands making it one of the rare combinations for a successful, fast paced progression in financial inclusion process [27]. DFI is mainly adopted for online money transactions and mobile banking services by public, without emphasizing much on the financial literacy of individuals through FinTech platforms, also, it is important to have digitally literate, proactive members in the boards of the firms that favor digitalization policies taken up by the firm along with cohesive environment prevalence makes the firms offer and implement efficient digital products [19] [28] that helps in DFI practices such as making women take part in DFI through financial literacy, that are facing hardships due to socio-cultural obstacles in small towns and rural regions [29] [13] [30] [31] or in improving the small and family owned business efficiency in this digitalized world [32], as the number of small and family owned businesses are high in numbers in developing countries; or in mitigating or eliminating the income inequalities that are prevailing due to complex socio-economic culture prevailing [33] and thereby helping policy makers in formulating poverty alleviation plans based on regional requirements and this also helps in eliminate digital divide prevailing in society due to hi-technology driven environment [34]. Bibliographic studies on technology adoption during and after pandemic conditions of 2020 and 2024 on the digital payment systems' adoption and use have emphasized on the availability of infrastructure, technology adoption and policy decisions by governments which contributed to the gross domestic product (GDP) growth as well [35] [36]. Geo political conditions like war, trade restriction, export-import duties, export-import policies of governments, skilled and trained labor availability also play key role in the adoption and use of DT across the globe [37].

One of the problems identified by the researchers is inactive bank accounts being maintained by the public, which doesn't compose of the financial inclusion process, it has been identified that, inactive accounts is not a problem of financial illiterates, it is common one among financial literates as well; that needs to be addressed by the governments. Account inactive nature is attributed to factors such as behavioral intentions, perceived usefulness, perceived ease of use of technology acceptance model (TAM), along with factors addressed in technology impact model variables highlighted by Ozili in his studies [38] apart from social influence due to satisfaction derived by self and others [39] [40]. FinTech

adoption helps create liquidity among banks, improving their operational efficiency with minimal costs associated with banking activity such as deposit mobilization, processing loan applications, verifying identity and credit scores of aspirants through a systematic procedure approved by the monitoring regulatory agencies [41] [42], [43]. FinTech gave opportunity to its users of switching between one operator to another in cases where the clients are not satisfied with the operators' service quality or charges levied by them or operational inefficiencies etc. push-pull-mooring model helps in understanding a client's behavior in shifting from one to another [20], [44] [45]. It also helps small and family owned businesses in mobilizing loans with nominal or cheaper interest costs to them allowing to sustain their business operations for long-term periods [46]. One of the major concern of digital payments is usefulness, awareness, perception towards DT use, secured payment process and customer's data privacy maintained by the agencies drives the satisfaction levels of users [8], [47] [48]. Blockchain and particle swarm optimization (PSO) technologies adoption together solves privacy, accuracy and swiftness in transactions due to autonomous execution of transactions with optimal security due to blockchain technologies' integration that restricts fabrication trials by hackers [49] allowing client's transactions safety and rigorous use that spearheads DFT and DFI happen as a hand-in-hand process. In today's global economic scenario, countries across are moving towards technology driven payment system at micro and macro level advocating for a cashless economy that may drive world towards a single common digital currency [11].

3. Methodology

3.1 Research Gap

The literature gave an overview about the digital financial inclusion using varied tools adopted by financial institutions at different places across the globe, which led the authors to observed that there exists a gap in the adoption and implementation of DFI framework by policy makers and in the adoption and implementation by the various players of industry. Hence, the current research work is undertaken to observe how DFI played role in the rural regions and small towns.

3.2 Research Questions

Based on the gap identified in literature the following research questions are framed for the present research work.

1. Is UPI is easy to adopt and use among rural vendors?
2. Is UPI is easy to adopt and use among rural daily wage laborers?
3. What are the various factors that are looked into by rural population to adopt and use the digital financial technology tools like UPI?
4. Is DFI effective and helping the rural consumers for their day-to-day activities due to the adoption of UPI?
5. Are the policy makers and the monitoring and regulatory agencies are meeting the requirements of rural population for an effective DFI process through UPI services?

3.3 Research Objectives

- DFT is helping in smooth financial flow through the UPI system in rural regions like Kuppam in Andhra Pradesh state of India.

- After the pandemic, people are preferring to use UPI services for their daily financial transaction needs
- Transfer of money has become easy with the use of UPI services
- Bill payments have become hassle free with UPI use
- Users are satisfied with the privacy and security concerns
- People are expecting UPI services be extended for more services and promote through monetary benefits for their use.

3.4 Data Collection

A self-administered questionnaire in vernacular (Telugu) language, later translated to English is circulated among randomly selected sample of individuals that are using Unified Payment Interface (UPI) services offered by various market players like paytm, gpay and so on.

The study is conducted at Kuppam town of Andhra Pradesh state in India. This town has four revenue divisions covering Kuppam as per 2011 census, Kuppam town has a resident population of 21963, of which 11091 are male and 10872 are female. It has a working population of 8640 individuals of which 6200 are male and 2440 are female that form part of the current study. Further, 7740 (89.59 per cent) are in the main stream working class, and 900 are gig-workers. The literacy rate of the town is at 83.62 per cent.

The town is surrounded by villages that are part of Kuppam revenue mandal with a total population of 120,479, who will be visiting the town for some or the other works, including the sale of their horticulture produce, as the town is known for its flower market.

3.5 Sample Size

Cochran's sample size formula for infinite population:

$n_0 = \{[Z^2 \text{ x } p \text{ x } (1-p)] \div C^2\}$

$n_0 = \{[(1.96)^2 \text{ x } 0.05\text{x } (1-0.05)] \div (0.05)^2\}$

$n_0 = \{[3.8416\text{x}0.0475] \div 0.0025\} = 72.99 = 73$

'n_0' is Initial sample size for infinite population

'Z' score @ 95% confidence level

'C' is margin of error @ 5%

'p' is estimated population proportion in per cent.

Cochran's sample size formula for finite population:

$n_{adj.} = n_0 \div \{1 + [(n_0 - 1) \div N]\}$

$n_{adj.} = 73 \div \{1 + [(73 - 1) \div 21963]\}$

$n_{adj.} = 73 \div 1.003278 \quad = 72.76 \qquad = 73.$

'$n_{adj.}$' is sample size for finite population

'N' is size of finite population

The calculations show that the minimum required sample for the current study is 73, out of a finite population of 21,963; however, the researchers are able to collect data from 102 sample, but two of the questionnaires are incomplete in nature, making the final sample size to 100, which is almost 37 per cent above the minimum required sample size.

3.6 Statistical Tools Applied

Researchers applied bivariate correlation and relationship analysis apart from descriptive statistics to understand the relationship between DT and the use of UPI services by individuals.

4. Results & Discussions

Figure 1: Age Group

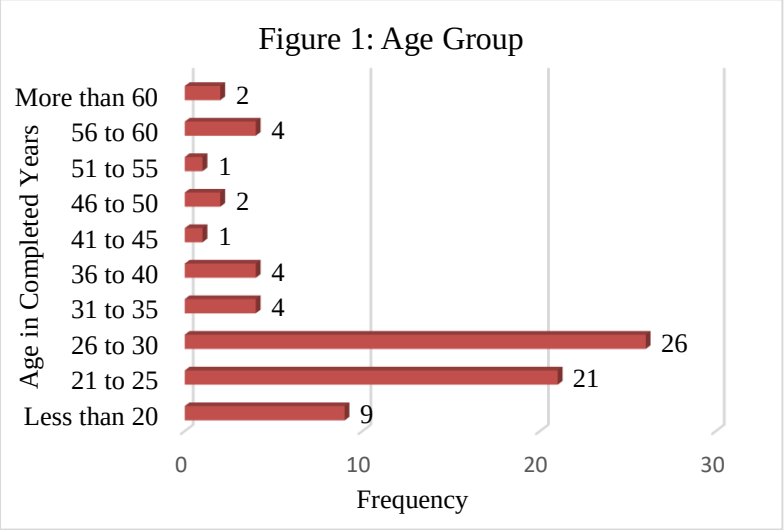
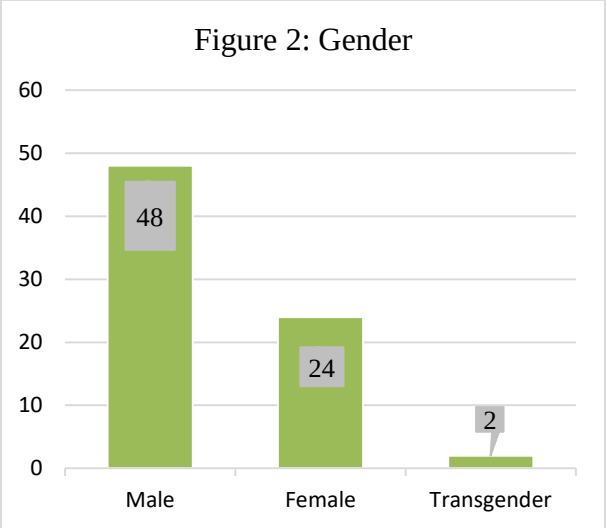


Figure 2: Gender



Source: Compiled by researchers using MS Excel

Inclusive class interval is adopted to analyze the age group of respondents starting from 21 to 60 years with a class interval of five years each. However, in India, the legal age to operate independently of financials is 18 years' completion, the researchers have considered less than 20 years as one of the categories. Apart from this, more than 60 years' individuals as another age group as a whole to understand the senior citizens' usage separately; hence, making the primary age groups for the current study lying between 21 to 60 years only. Figure 1 shows the age distribution of respondents. It is learnt that 47 out of 74 sample are in the age groups of 21 to 30 years with 26 in 26 to 30 years and the rest 21 in the 21 to 25 years of age category that falls in the youth segment. Results also indicate that middle aged respondents i.e. 36 to 50 years are 7 only, especially 41 to 45 years' age category being only one, which is very low.

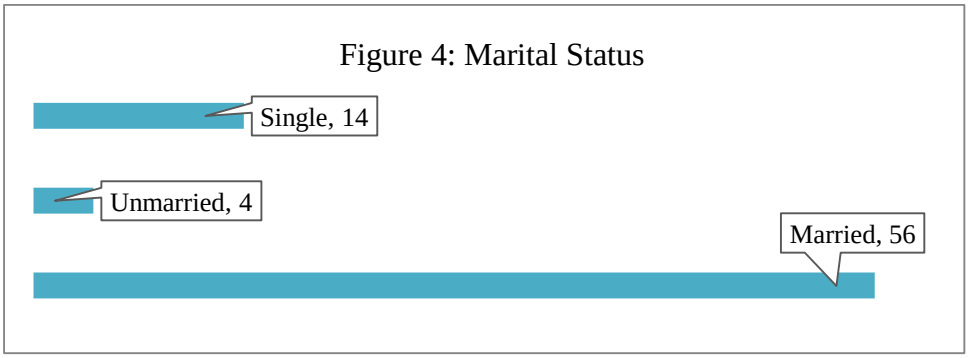
Also, the number of people responded that are more than 60 years is also two only. It is also noticed that there are 48 male and 24 female respondents apart from two transgender (figure 2) in the sample.

Figure 3: Educational Qualification

Source: Compiled by researchers using MS Excel

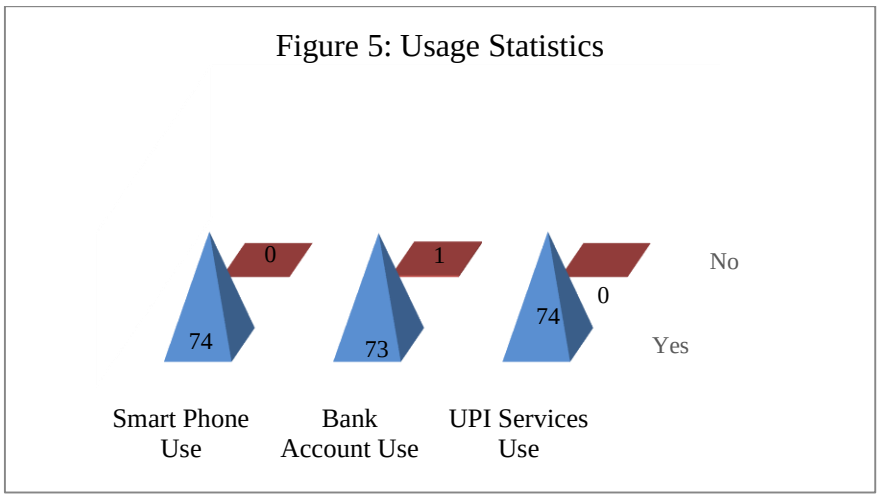
For the research purpose, educational qualification (figure 3) of respondents is classified into five categories, namely post-graduation, under graduation, higher secondary schooling, primary schooling and others that include professional certifications. It is learnt that 100 percent are literates, out of which 41 are graduates, 16 are post-graduates and 2 possess other qualification that covers professional certifications; totaling 79 percent of the respondents in total, which is a healthy educational qualification for a small town like Kuppam with population of approximately 22,000 as per 2024 municipal census records.

Figure 4: Marital Status



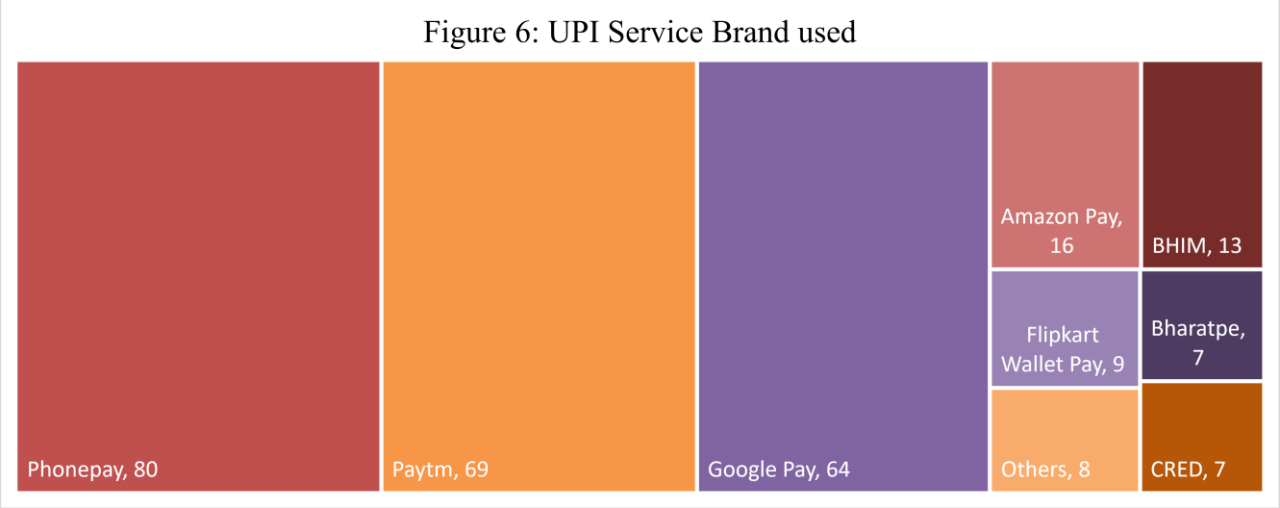
Source: Compiled by researchers using MS Excel

The last demographic variable that is tested by researchers is about marital status of respondents (figure 4), where 56 are married, 4 are unmarried which includes divorcee or a widowed as well. However, among the respondents, there are no divorced or widowed ones as per the responses, but there are 14 single persons who doesn't have a partner so far in life and are available for a relationship. So, marital status provides clarity to researchers in driving down to a point about the use of digital financial transactions by different categories of individuals, based on which their transaction needs can be analyzed.



Source: Compiled by researchers using MS Excel

Figure 5 shows the usage statistics of respondents such that the effectiveness of digital financial inclusion can be understood. Results show that 100 percent individuals are using a smart phone, while 98.65 percent (73) have a bank account, while 74 (100%) are using UPI services for easy and quick transactions. Among these 74 respondents, 64.86 percent (48) are male, 32.43 percent (24) are female and the remaining 2.71 percent (2) are transgender individuals; 75.68 percent (56) are married, 5.4 percent (4) are unmarried and the remaining 18.92 percent (14) are single.

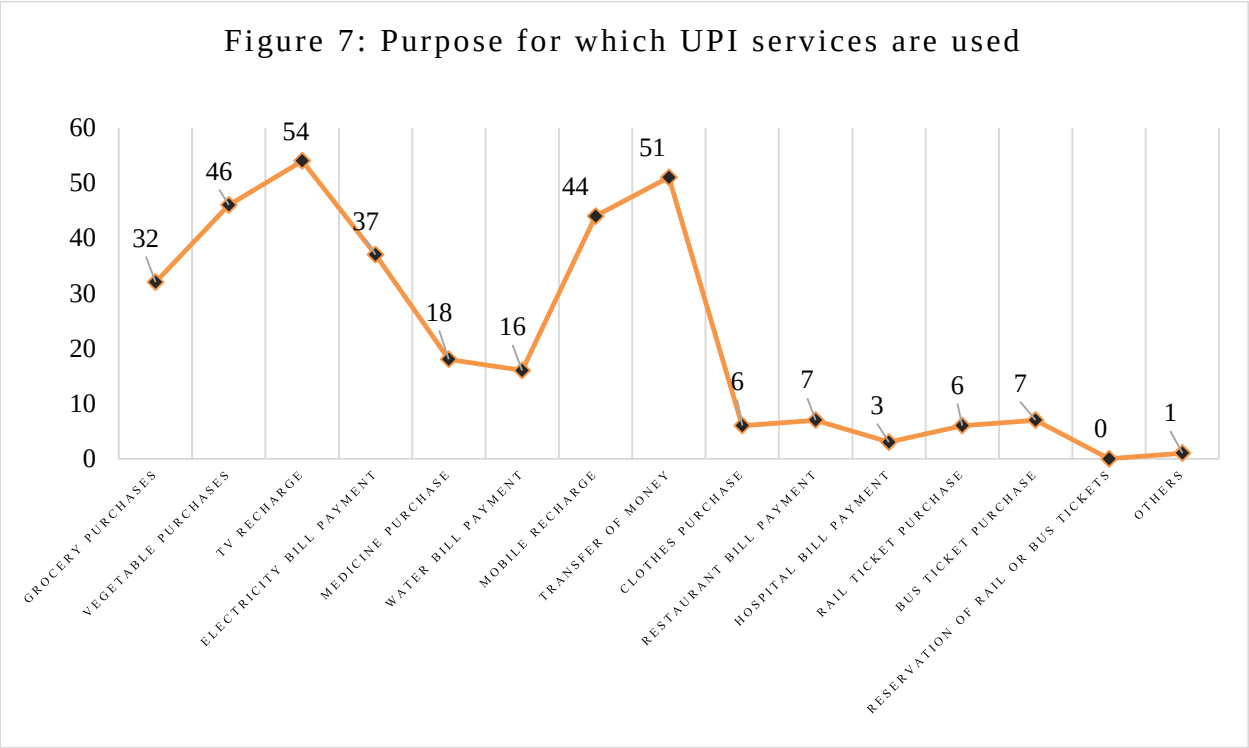


Source: Compiled by researchers using MS Excel

To know the popular UPI service brand in the market in rural region, the researchers asked about various service brands prevailing in the market and consolidated the results in figure 6. It is observed that respondents were using multiple brands or players' services simultaneously with more number of people using Phonepay followed by Paytm and Googlepay. It is noted that government managed platform BHIM and other players like Bharatpe and CRED are also in use; however, wallets such as Amazon and Flipkart wallet services use hasn't crossed 25% of total digital payments services use. though it is a healthy sign of using multiple brands for payment services to optimize the payment structure, people need to be educated on the wallet service use for which the companies need to take initiatives and encourage payment

through their service platforms such that payments happen swiftly and services provision is fast as well as can gain market share. Followed by service providers, researchers have tested for the purpose for which UPI services are used (figure 7) by individuals, in which, it is evident that most of the people use UPI services for their household requirements such as grocery, vegetable purchases on daily basis; followed by television and mobile recharge payments and for money transfer to others.

Figure 7: Purpose for which UPI services are used



Source: Compiled by researchers

The figure mainly discloses that UPI services are mainly used for small payments of daily needs, rather for high or unbudgeted expenses such as hospital bill payment, reservation of train or bus tickets or purchase of clothes from shops. This indicates a pattern where individuals are preferring payments to those whom they encounter at regular time intervals rather those payments that happen once in while or at irregular time intervals. This is due to volume of money involved in such transactions and a possibility of transfer to a wrong party even by mistake, makes tracing and recovery a tedious task for the transferor, which the respondents doesn't like rather avoid the use of UPI services for such transactions and in place of that, use other DT mode such as debit or credit card, internet or mobile banking etc. limiting UPI services use in small towns to small and high frequency transactions to trusted parties.

4.1 Correlation Analysis

Table 1 Bivariate Correlation between demographic variables to use of UPI services				
	Age		Gender	
	Pearson Correlation	Sig. (1-tailed)	Pearson Correlation	Sig. (1-tailed)
I use UPI Services	0.011	0.455	0.005	0.479
	Academic Qualification		Marital Status	
	Pearson Correlation	Sig. (1-tailed)	Pearson Correlation	Sig. (1-tailed)
I use UPI Services	0.036	0.360	0.077	0.222
**. Correlation is significant at the 0.01 level (1-tailed).				
N = 100 Source: Results generated for the data collected using SPSS28.0.0.0(190)				

Bivariate correlation is tested between demographic variables and the use of UPI services to find out whether demographic factors are in any manner influencing individuals in the use of UPI services during the data collection period (Table 1) and results indicate that there doesn't exist correlation between use of UPI services and age, gender, academic qualification and marital status, which are nominally correlated (1.1%, 5%, 3.6% and 7.7%) respectively and are not significant from statistical evidences. This shows that irrespective of age, gender, academic qualification and marital status; people are using UPI services is an indication for adaptation to digital banking process by individuals in small towns like Kuppam, which is a welcome sign to introduce and promote digital financial products by banks and others. To confirm the same, bivariate correlation is tested for demographics and digital financial transactions related data collected during the study period with fifteen questions that are framed based on technology acceptance model (TAM) guidelines and the results (Table 2) are analyzed independently as each question is tested for each of the four demographic variables.

Table 2 Bivariate Correlation between Digital Financial Transactions to Demographic Variables								
	Age		Gender		Academic Qualification		Marital Status	
	Pearson Correlation	Sig. (1-tailed)	Pearson Correlation	Sig. (1-tailed)	Pearson Correlation	Sig. (1-tailed)	Pearson Correlation	Sig. (1-tailed)
Digital transactions are cost effective	-0.144	0.076	.193*	0.027	-0.146	0.074	0.147	0.072
Digital transactions	-0.045	0.327	-.165*	0.05	0	0.499	0.074	0.232

are more secured								
Digital transactions promote financial inclusion	-.224*	0.013	0.099	0.164	-0.091	0.183	.179*	0.038
Digital transactions are useful in easy transfer of money	0.053	0.299	-0.033	0.373	0.028	0.391	0.059	0.281
Real time money transfer helps digital transactions increase	-0.159	0.057	0.086	0.197	0.023	0.41	0.126	0.105
Digital transactions increases financial literacy	-.218*	0.015	-0.026	0.4	0.128	0.103	0.139	0.084
Financial literacy is a pre-requisite for digital transactions	-0.157	0.06	.188*	0.03	0.11	0.138	0.081	0.211
Financial connectivity improves with the help of digital transactions	-.183*	0.034	-0.047	0.32	-0.081	0.211	-0.01	0.461
Completely satisfied with the way digital transactions work	-0.128	0.103	-0.003	0.488	0.136	0.089	0.108	0.143
Digital transactions	-0.076	0.225	0.005	0.482	-0.025	0.401	0.151	0.067

are implemented effectively by the relevant players								
There is no gender disparity in the use of digital transactions	0.002	0.491	.191*	0.028	0.027	0.395	0.083	0.206
There is no age disparity in the use of digital transactions	-.201*	0.023	-0.034	0.367	0.03	0.383	0.143	0.077
Digital transactions eliminated the gap in financial processes of deposits or loans	-.223*	0.013	0.069	0.248	-0.046	0.326	0.148	0.071
Digital transactions help minimize the financial costs	-.185*	0.032	-0.125	0.108	-.185*	0.033	0.113	0.131
Digital transactions help minimize the delay in financial transactions between parties	0.059	0.278	0.038	0.354	0.116	0.125	0.154	0.064

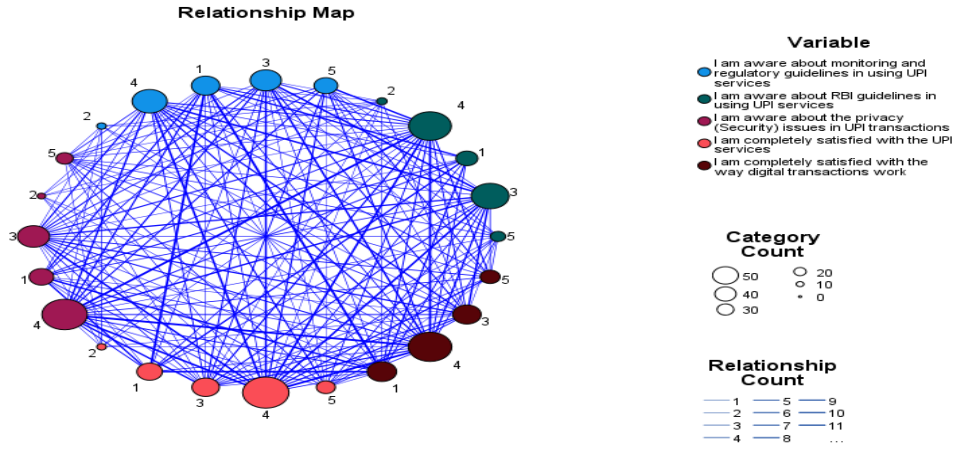
*. Correlation is significant at the 0.05 level (1-tailed).
N = 100 Source: Results generated for the data collected using SPSS

As depicted in table 2, demographic variables to DT use is tested, it is found that age played significant role in promoting digital financial inclusion (0.013), digital financial literacy (0.015), financial connectivity (0.034), not showing any age disparity (0.023) in DT adoption, eliminates the gap in financial process of deposits and loans (0.013), minimizes the financial costs (0.032) involved in transactions. However, financial promotion (-0.224), digital financial literacy (-0.218), increased financial connectivity (-0.183), age disparity in the use of DT (-0.201), mitigating the gap in financial process for loans and deposits (-0.223), and minimizing operational costs (-0.185) all have shown the negative correlation, hinting that there lies a difference in opinion among age groups; which itself is a disturbing factor for the implementation of technology in banking and financial services industry. Both the gender feel that cost effectiveness prevails due to the adoption of DT, as the correlation value is 0. 193 with a significant value of 0.027; while, security concerns are seen different by both the gender though the correlation is significant (0.05), it is negative (-0.165). Male and female respondents also feel that people should have prior financial literacy with 'r = 0.188' and a significance value of 0.03, and none of the other demographic variables have shown significance for this variable and hence, it indicates that people in towns still feel that financial literacy is a pre-requisite for adopting digital processes effectively. Also they feel that there is no gender bias in the use of DT for financial transactions in the region (r = 0.191) with a significance value of 0.028. Academic qualification is insignificant for all the conditions except for one question where, it is felt by respondents that DT will be able to minimize the financial costs (0.033), but in negative manner (r = -0.185) which means, higher the DT that an individual use, lesser will be the costs incurred by him/her. The only factor for which marital status is significant (0.038) is for DT role in the promotion of financial inclusion with 'r = 0.179' where marriage and financial inclusion are related to one another, where individuals feel responsible and start using accounted for means of spending that is recorded at some place. However, it is observed from results that the correlation values are nominal for all the contexts and results, which indicates, there exists a weaker influence of demographic variables on the use of digital technology in Kuppam town.

4.2 Relationship Map

Relationship map of satisfaction and awareness about monitoring and regulatory agencies role in UPI services use is shown in figure 8 below, where higher the count is greater is the relationship of that particular factor on the awareness about monitoring and regulatory agencies norms by the respondents. Results indicate that respondents are able to understand the RBI guidelines and privacy issues about DT and hence are satisfied with the use of UPI services and the way DT work.

Figure 8 Relationship Map of Satisfaction and Awareness about Monitoring and Regulatory Agencies Role in UPI Services Use



Source: SPSS results generated by researchers

5. Conclusion

Penetration of digital banking can be understood from the current study where individuals in small towns are using the UPI services for their day-to-day transactions requirements, for which a self-administered questionnaire helped in collecting the empirical data for which statistical tools such as bivariate correlation and relationship assessment is done and found that DT are used by individuals and feel that it brought ease of transacting along with tracking the same. Results reveal that demographic factors doesn't have any relationship with the use of UPI services and the same is confirmed with the bivariate correlation analysis on DT analysis; after which relationship map is studied whether individuals understand monitoring and regulatory guidelines along with privacy norms that safeguard their interests and found that people are aware about guidelines and follow them at regular time intervals to update their knowledge and rights, but lot more needs to be done by these monitoring and regulatory agencies in including digital banking process that caters the digital financial inclusion requirements and targets set by central and state governments to bank the unbanked areas across India. This study is helpful for researchers in analyzing the penetration of digital banking in small towns there by helping banks and UPI service provides in formulating their strategy of boosting awareness about DT importance, helping each other in enhancing the quality of digitalization processes across banking industry. This study is also helpful for companies in analyzing the customer satisfaction to enhance quality as well as premium operations at a charge which increases their revenue as well. This study helps banks in identifying movement of DT based on which privacy related decisions can be made at bank level, establishing relationship with clearing houses and service providers for quality and speedy transactions.

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