National College of Ireland

The Driving Forces Behind the Shift to Cashless Transactions: Their Impact on the Economic Efficiency, Security, and Resilience

MSc Research Project
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MSc Project Submission Sheet

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The Driving Forces Behind the Shift to Cashless Transactions: Their Impact on the Economic Efficiency, Security, and Resilience

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Abstract

This study examines the driving factors behind the shift to cashless transactions in India and their impact on economic efficiency, security, and resilience. There is a rising popularity in the adoption of digital payment systems such as Unified Payments Interface (UPI) and mobile wallets. The research focuses on understanding the consumer perception of cashless transactions, the government initiatives like the Digital India Campaign followed by its effectiveness in accelerating the adoption of cashless transactions. The study is conducted using qualitative and quantitative methods by doing a survey of 102 participant's responses to identify key factors influencing the shift to cashless transactions, which include convenience, transaction speed, and security features. The findings display that India's younger demographics are leading this shift, but there are significant challenges like privacy concerns and infrastructure reliability on cashless transactions. The study highlights the benefits of cashless transactions for the economy, GDP growth and financial inclusion. It also discusses the need to improve digital literacy and security measures to ensure wider adoption and resilience against cyber threats.

1 Introduction

The paper discusses several key factors that changed the trajectory of financial interactions globally. Cash is no longer king, metaphorically speaking (Arango-Arango et al., 2018). The digital transformation and upheaval in technological advancement paved the way for digital wallets or electronic wallets which not only help consumers pay retailers in a single tap but also facilitate easy transfer to peer consumers in no time. Moreover, the shift to cashless transactions is strengthened by heightened security features linked with digital payments. Two factor authentication techniques, encryption, and biometric authentication acts as a layer, (Ministry of Electronics and Information Technology, 2021, p.15) protecting against theft and fraud, whereas cash transactions lack safety and are devoid of these features. Hence, cash transactions are more susceptible to frauds and crimes.

The study focuses on the Indian market to understand the consumer's stance in cashless transactions. To objectively identify the factors and determinants for adopting cashless transactions further analyze their impact on economic efficiency, security, and resilience. The research objectives are constructed to analyze how cashless transactions are affecting economic efficiency and how it can contribute to economic growth (GDP growth). To understand the consumer perceptions, behaviors, concerns, and expectations from cashless

transactions, including advantages and challenges they face while utilizing mobile wallets. To assess whether government initiatives like the Digital India Campaign aid the spread of cashless transactions. Additionally, to measure whether these initiatives helped consumers to opt for cashless transactions. To gauge the resilience of cashless transactions against cyberattacks and potential security disruptions.

Digital payment provides unbanked and underbanked populations with access to financial services through mobile technology which contributes to financial inclusion (Rahman et al., 2022) as highlighted by the Global Findex Database. (Demirgüç-Kunt et al., 2022). The transformation to a cashless economy will not only reshape the economic landscape but also foster economic resilience. Hence, the reliance on physical currency will reduce significantly (Rogoff, 2016).

The adoption of cashless transactions garnered significant attention ostensibly in developed countries, potentially due to the economic benefits, security, and financial resistance. The likelihood of developing countries especially India too, saw a commendable growth in usage of cashless transactions. Although there is a body of literature discussing the advantages of cashless payments in developed economies (Hasan et al., 2013; Tee & Ong, 2016), there is less of it that focuses on the Indian market, particularly when it comes to examine the factors and interplay between resilience, security, and economic efficiency. The two studies conducted by Awasthy, Mishra, and Dhal (2023) and Mahesh & Bhat (2021) that have looked at the factors which influenced the adoption of digital payments, but they tend to lack an integrated perspective that includes security concerns and economic resilience. Furthermore, many researchers fail to highlight the demographics variables such as age and education that have a substantial impact on adoption rates in India. This research seeks to fill the gap by not only finding the driving factors behind the shift to cashless transactions but also gaining the perspective of population on cashless transactions impact on economic efficiency, security, and resilience within the unique socio-economic framework of India.

Figure 1: Mobile Wallets
Source: Kaggle, UPI Apps Transactions in 2021 Dataset (Ramjas Maurya, 2021)

2 Related Work

2.1 Growth and Development of Cashless Transactions in India

The purpose of the literature review is to mention all the related work carried out in the past to study the development and adoption rate of cashless transactions. The study focuses on the Indian market. India saw rapid growth and transformation in the digital ecosystem due to the policy thrust of the Reserve Bank of India (RBI), government initiatives, and retail payments conducted digitally using a Unified Payment Interface (UPI), have seen a compounded annual growth rate (CAGR) in terms of both volume and value (Reserve Bank of India, 2023). The setup of UPI is very easy. Users link their bank accounts and initiate transactions using a UPI ID and a Mobile Personal Identification Number (MPIN).

2.2 Adoption and Usage of E-wallet in India

The secondary research paper "Digital Payment Service in India: A Case Study of Unified Payment Interface" provides the SWOT analysis of Unified Payment Interface (Mahesh & Bhat, 2021). According to the reports the UPI has grown signficantly, especially in the retail payment sector. The growth is driven by factors such as increased smartphone penetration, technological advancements, and initiatives like Digital India and demonetization (Mahesh & Bhat, 2021). It has been noticed that many people use cashless transactions to save time and energy. The Google Pay is most widely used among all other e-wallets like Phone Pe and Paytm. (Sirisha and Anitha, 2021). But the system also faces challenges like technical glitches, security concerns, and resistance from segments of the population who still prefer cash transactions (Mahesh & Bhat, 2021).

2.3 Cash Demand and Digital Payment Paradox

The paper analyses the situation of paradoxical increases in both Indian currency demand and electronic payments. The descriptive analysis and empirical insights in this paper demonstrate the growth currency which is driven by precautionary factors (holding cash for emergencies) and store-in-value motives, despite a decline in cash usage for transactions. It sums up that income is the main factor that drives currency demand, the rapid rise of digital payments could potentially moderate this effect due to their inverse relationship with cash usage. The significant rise of digital payments in India is further bolstered by the pandemic situation but also saw the holdings of cash for emergencies and personal motives (Awasthy, Misra, and Dhal, 2023).

The authors in the RBI dataset used the Autoregressive Distributed Lag (ARDL) model. The econometric model here is used to understand the relationship between the currency demand which is the dependent variable, and income, interest rates and digital payments which are the independent variables while uncertainty index and credit-to-deposit ratio are the precautionary variables. The empirical data clearly shows there is a rise in the large denomination notes (Awasthy, Misra, and Dhal, 2023).

The findings showed the inverse association between digital payments and cash demands. It is obvious that if people start using electronic payment methods to pay for services and goods,

they tend to carry less cash. This is termed as Substitution Effect (Awasthy, Misra, & Dhal, 2023). The increase in income drives higher cash demand despite the rise of digital payments. Moreover, economic uncertainties and the COVID-19 pandemic led to people opting to keep cash on hand for precautionary reasons.

2.4 Government Initiatives and Financial Inclusion

The paper "Financial Inclusion - Past, Present and Future," was an inaugural address by Shaktikanta Das, Governor of the Reserve Bank of India (RBI), at the Economic Times Financial Inclusion Summit. A significant enhancement is seen in the realm of financial inclusion brought about by the Jan Dhan, Aadhar, and Mobile (JAM) ecosystem. Additionally, several initiatives have been carried out to build the necessary infrastructure at the ground level to universalize digital payments in a manner which is practical, safe, convenient, and secure. The fintech companies in India like Paytm, Phone Pe and Google Pay led to the growth of cashless transactions in mobile wallet usage. Between May 2017 and May 2021, the number of Prepaid Payment Instruments (PPIs) grew significantly with a compounded annual growth rate (CAGR) of 53%. PPIs have gained popularity for making small-value payments, particularly wallets and cards. Systems like Unified Payment Interface and Immediate Payment Service (IMPS) have completely changed the payment landscape in India by providing round-the-clock availability and instant credit to recipients (Das, 2021). AePS facilitates cash withdrawals, payments and fund transfers through micro-ATMs and Business Correspondents (BCs) using Aadhar authentication (Das, 2021). The Ministry of Electronics and Information Technology (MeitY) launched the DigiDhan Mission in June 2017. The objective of this mission was to facilitate seamless electronic payments for all Indian citizens (Ministry of Electronics and Information Technology, 2021, p. 3). Millions of people received Direct Benefit Transfers (DBT) during the pandemic through Pradhan Mantri Jan-Dhan Yojana (PMJDY) accounts enabling Indian access to financial services. The National Centre for Financial Education (NCFE) and the Centre for Financial Literacy (CFL) are projects aiming to enhance digital financial literacy through digital means (Das, 2021).

The RBI governor mentions the operationalization of the Payment Infrastructure Development Fund (PIDF), an initiative of the RBI, banks, and card networks to push the development of payment acceptance infrastructure in tier-3 to tier-6 centers and northeastern states. This will promote the deployment of electronic payment facilities in untapped areas (Das, 2021). The potential growth could be achieved through the RBI's pilot project in association with banks with a plan of making at least one district in each State 100% digitally enabled (Das,2021).

2.5 Impact of Cashless Transactions on Economic Growth

The "Cashless and Economic Growth" paper examines the impact of adopting cashless payment on economic growth in countries like Austria, Belgium, France, Germany, and Portugal, for the years 2000 -2012. The study collects data on GDP and CPI from the International Monetary Fund (IMF), while payment data is sourced from the European Central Bank (ECB). The Gross Domestic Product is divided by the Consumer Price Index.

The real GDP is considered a proxy for economic growth. Since an increase in GDP is a positive indicator for the economy (Nenavath, 2020).

The methodology used to assess both short-term and long-term effects of cashless payments on economic growth are Pedroni residual cointegration and Panel Vector Error Correction Model (VECM). These advanced econometric techniques allow the researchers to analyze the dynamic relationships and interactions between variables over time. The study revealed key findings related to the adoption of one type of cashless payment, which influences the use of the other types in the short run. The countries considered for the examination showed that the adoption of cashless payment systems has a significant long-term effect on economic growth. However, the impact will not be immediately apparent since it will take time to manifest. The study proves the cointegration and adoption of cashless payment systems will have a positive impact on economic growth (Tee & Ong, 2016).

2.6 Correlation Between Retail Payments and Real Economy

Similarly, the paper “The Impact of Digital Payments on Economic Growth” by Hasan, I., De Renzis, T., & Schmiedel, H. (2013) explores the relationship between retail payments and the real economy. Here, it collects data from 27 European countries mentioned 1995-2009, revealing that efficient payments stimulate the overall economy, consumption, and trade. Card payments have the strongest impact, followed by credit transfers. The study supports policies promoting swift migration to efficient electronic payment instruments, particularly in euro-area countries (Hasan, De Renzi's, and Schmiedel, 2013). A positive relationship is described between the usage of card payments and GDP growth. There is a significant GDP rise if the card penetration and its usage increase. On the contrary, the same relationship is not established between cheque payments highlighting low macroeconomic impact. Real economic aggregates and retail payment transaction technology are positively correlated (Hasan, De Renzi's, and Schmiedel, 2013, p. 4).

2.7 Cashless Transaction Adoption Model (CTAM)

The Cashless Transaction Adoption Model (CTAM), specifically in the context of cashless transactions, was curated and validated by Vimal Raj L., Amilan S., and Aparna K. (2023) Through this model, the behavioral intention to adopt cashless transactions is predicted and explained, integrating various constructs. The list of constructs includes performance expectancy, effort expectancy, perceived trust, personal innovativeness, social influence, self-efficacy, perceived risk, perceived costs, anxiety, behavioral intention, and actual use. The model additionally includes perceived economic offense reduction, perceived economic benefit, and perceived economy security, which potentially influence individual’s behavioural intentions towards adopting cashless transactions (Raj, Amilan, and Aparna, 2023). The use of partial least squares-based structural equation modeling (PLS-SEM) provides a solid foundation for conducting the study, helping to examine relationships between multiple variables effectively.

The frameworks studied in the paper "Developing and Validating a Cashless Transaction Adoption Model (CTAM)" provide the foundation for examining the driving forces behind the shift to cashless transactions. The study is conducted via a survey in the urban region of

Banglore. A limitation of the study is that there is no cross-cultural validity to prove the findings are applicable in distinct cultural contexts (Raj, Amilan, and Aparna, 2023). A further weakness is the potential bias of convenience sampling and self-reported data. The model is comprehensive but due to the high number of variables, it is not convenient to apply in simpler practical case situations for a quick assessment.

2.8 Technological Advancements and Payment Infrastructure

The list of the convenient factors mentioned in the earlier literature and reports is as follows:

Technological Advancements brought Unified Payment Interface, Quick Response Codes, digital wallets (PPIs), and tap-to-pay capabilities on debit and credit cards offered quick and simple ways to make payments. Today, credit and debit cards can pay with a single tap at merchant Pos (point-of-sale) terminals, saving around 30 seconds for each transaction. This is done because credit and debit cards have NFC chips. They can also link their cards to mobile wallet apps and smart watches, streamlining the transactions. Near Field Communication revolutionized the cashless payments system by providing advanced technology for making contactless payments. An easy method of tapping on the payment machine appeals to its consumers to continue to use it. Due to the consumer's preference, NFC is integrated into mobile wallets like Apple Pay and Google Pay further supporting the shift towards cashless society (Kadir, Shamsuddin, and Rosa, 2015).

Financial Incentives like cashback rewards and offers are drawing customers to pay online and go cashless (De, 2022). The advancement of QR technology, where merchants use the "QR sound box" to confirm the successful payment made by the consumers after scanning the QR code. The merchants need to pay a rental fee of INR 125 per month (Impact Assessment of DigiDhan Mission, 2024, p. 14). The catalyst that led to cashless transactions was the COVID-19 Pandemic, it accelerated the growth of electronic payments to avoid physical contact and reduce the risk of virus transmission (Impact Assessment of DigiDhan Mission, 2024, p. 18).

2.9 Classifying Cashless Payment Solutions at the Country Level

The next paper is titled as "Can we classify cashless payment solution implementation at the country level." The paper presents a comprehensive framework to understand the implementation of cashless payment solutions at country level. The authors Ng, Kauffman, Griffin, and Hedman (2021) mention a 3-D classification framework. The 3 elements of the framework are; The local implementation environment digitalization which broadly studies the extent of digital technology adoption in local settings. The technological novelty to measure the innovativeness of cashless transactions in a specific country environment. The third element is national infrastructure development of a country that supports cashless transactions. The authors argue that there is no specific objective of "high tech" and "low tech" solutions, on contrary the effectiveness of cashless transactions solution depends on the nation's familiarity with digital payments. According to the study, the developed countries should deal with issues like cost and consumer pattern, while developing countries should leapfrog legacy systems by leveraging the mobile payment application (Ng et al., 2021).

2.10 Security Concerns in Cashless Transactions

“Towards the Advancements of Cashless Transactions: A Security Analysis of Electronic Payment Systems” by Moon et al. (2022) provides in a theoretical framework for the methodologies to assess the Fintech application security strength and its challenges. It mentions that cashless transactions are vulnerable to security breaches and cyberattacks. The paper discusses advanced technologies like Near Field Communication (NFC) and QR codes to enhance the security practices for mobile banking apps. (Moon et al., 2022). The study emphasizes the need to identify the cybersecurity threat and protect electronic payment systems in a changing digital landscape.

3 Research Methodology

The study's purpose is to find the driving factors behind the shift to cashless transactions. The paper analyzed what factors and incidents led to the growth of cashless transactions in India. Additionally, what significant impact will the cashless transactions ecosystem have on economic efficiency, security, and resilience? To answer these objectives, the study employed both qualitative and quantitative methods to provide a comprehensive analysis. Along with that, the paper studied different variables and determinants to validate the research objective.

3.1Research Procedure

Survey

To collect the primary data, the survey method was utilized. The survey questions included all the possible objectives to answer the research question. 22 questions were asked to the participants about cashless transactions. The questions covered the important objectives of the study and were framed in a manner to understand the perception of consumers regarding cashless transactions and the factors that drive the Indian economy to adopt cashless transactions. Additionally, the survey aims to gain insights on what impact cashless transactions will have on economic efficiency, security, and resilience. The surveys were conducted using google forms and distributed online. The Google forms included multiple-choice questions, checkboxes and one open-ended question. The questions were mostly inclined to qualitative data feeding on people's perceptions of the cashless ecosystem and its future. Due to time constraints and convenience factors, the best way to get the data was survey incorporation.

3.2 Ethical Consideration

The anonymous survey was conducted to get candid responses without the fear of participants being judged. To maintain anonymity and confidentiality the survey form was de-linked by name, email ID and IP address. Most of the participants were reluctant to answer the survey forms, to avoid these issues anonymity and confidentiality were prioritized. The participants were made aware of the objectives and methods implemented in the survey. The project complies with the General Data Protection Regulation (GDPR) by

putting emphasis on the data protection measures in place and using the data for only research purposes. The research ensures the credibility and dependability of its data and findings by maintaining these ethical standards.

3.3 Qualitative Research

The qualitative methodology approach was selected to focus on customer experiences, behaviors, and social phenomena through non-numerical data. The survey incorporated in the data collection gathered in-depth insights into concepts and perceptions of consumers regarding cashless transactions by asking open-ended questions. (Creswell and Creswell, 2017) Additionally, this approach made it possible to understand the subtle customer attitudes and motivations that could be missed by quantitative approaches. This led to a deeper understanding of the variables affecting the uptake of cashless transactions.

3.4 Quantitative Research

The survey is structured in a manner to quantitatively analyse the various aspects of cashless transactions, key drivers, consumer perceptions, behaviors, and security concerns Moreover, it measures economic benefits, and the government initiative on the adoption rate of cashless transactions. The survey included multiple-choice questions, Likert-scale items, and open-ended questions to capture a range of data points. The sample selection employed a stratified sampling technique to represent different demographic groups like location (urban, suburban, region), age, gender, education, and employment status. (Creswell and Creswell, 2017)

3.4 Data Analysis Techniques

To conduct research on the driving forces behind the Shift to Cashless Transactions and its impact on economic efficiency, security, and resilience. The best method for gathering the data was through a survey.
Google Forms: Uploading the questions on Google Forms was easy due to its friendly interface. 22 questions were documented in Google Forms from the Likert scale, multiple choice to open-ended questions to get varied data points for further analysis.
Microsoft Excel Data File: After getting enough survey responses on Google Forms. The data was exported to Excel File, for further cleaning and analysis. The data file in Microsoft Excel was cleaned and made consistent. The Excel file data was converted into a CSV file to upload on SPPS.
Statistical Package for the Social Science: Quantitative Analysis was done on data using the software tool Statistical Package for the Social Science for data management, documentation of survey data and statistical analysis. The Statistical Package for Social Science was used to do descriptive analysis, frequency analysis and cross tabulation analysis.

Google Colab: Leveraging the cloud-based environment for efficient data analysis google colab was utilized. The survey data was cleaned and prepared in Microsoft Excel, exported as a CSV file and imported into Google Colab for further analysis. The vertical and horizontal bar charts were created using Python libraries such as Pandas and Matplotlib. The bar chart illustrates the main advantages, factors, usage, and challenges while using cashless

transactions. This method facilitated the effective visualization to communicate its findings on the adoption and impact of cashless payment systems in India.

4. Design Specification

4.1 System Architecture

To conduct this research project on the driving factors and impact of cashless transactions in India, a streamlined system architecture was developed. This system effectively presents the data collection layer, followed by the data analysis layer and finally the presentation layer.

Data Collection Layer: The data collection layer involves the systematic primary data collection through Google form. The survey questions were framed to analyze and capture the diverse aspects of cashless payment systems in India. The questionnaire was distributed to the targeted audience via an online medium.

Data Analysis Layer: After the data was collected in Google forms, it was then exported to the Excel document where it was further cleaned and made consistent to upload it on the IBM's software SPSS (Statistical Package for the Social Sciences). The Excel document was converted to the CSV format file for processing the data. SPSS is a famous analytical tool to perform complex analysis like correlation and descriptive analysis of the vast data. Leveraging the SPSS tool descriptive statistics, cross tab analysis, frequency analysis was done. Additionally, Python software was used to create bar charts for better visualization of the data.

Presentation Layer: With the help of SPSS, findings and practical implications were derived by compiling the data. A comprehensive report and visualizations were generated for easy interpretation and accessibility.

Technical Requirements

Software: Google Forms, IBM SPSS, Microsoft Excel, and Google Colab.

Hardware: A typical computer system with enough RAM (8GB) and an Intel i5 processor or higher to run SPSS efficiently and manage big data sets without experiencing any lag.

5. Implementation

The sample size for the methodology is 102. The total number of respondents for the survey were 102 participants among them 52 were male and 50 were female respondents. The demographic analysis included variables such as age, gender, education, employment status and location of the selected population. A total of 21 variables were considered to understand the factors that are dominant when using cashless transactions consideration and their further implications on economic growth, security, and resilience. The demographic variables were age, gender, location, education, and employment status. Emphasizing the role of demographics played in the adoption of cashless transactions.

5.1 Objectives

The variables like “contribution to economic growth,” and “efficiency of financial transactions” determine how cashless transactions are affecting economic efficiency and how they are contributing to economic growth. Additionally, the variables to measure security concerns and trust in cashless transactions in the country were “security threats,” “privacy concern,” and “trust level”. The assessment of comprehending the resilience of cashless payment systems to disruptions or cyberattacks under the variable of “Resilience to disruptions.” Furthermore, the analysis of Government initiatives and policies framed was done. To confirm the effectiveness of these initiatives in encouraging the population to adopt electronic payment methods like BHIM (Bharat Interface for Money) and UPI. The National Payment Corporation of India (NPCI) created (Bharat Interface for Money), which facilitates digital transactions through the Unified Payments Interface (UPI). (De, 2022). BHIM seeks to empower India’s digitally native population and promote financial inclusion. The study of variables like “Future of Cash” and “Cashless Transactions Future” in India. The respective roles of the variables and aspirations were studied.

5.2 Data Analysis

Frequency Analysis: The frequency analysis was done to analyze the number of occurrences of each value or category within the variable data. Summarizing the maximum and minimum rate of the per cent to interpret the data. The analysis of survey data is displayed with proper frequency tables and appropriate bar charts.
Bar Charts: A bar chart is used to highlight the graphical representation to display the count of the variables and factors considered. Bar charts are easy to read and compare different options and categories under a specific variable.
Cross-Tabulation: The cross-tabulation analysis is complemented by a chi-square test for statistical importance. It provided a method for examining how awareness of government initiatives might be effective in encouraging the adoption of cashless payment methods. It provided the trends and patterns for better policy formulation.
Descriptive Analysis: Descriptive statistics provide basic summaries about the sample and the measures. It included frequency distributions displaying demographic variables data such as age, gender, education status and employment of the participants, and standard variations for various variables such as age, frequency of cashless transactions, and perceptions of cashless payment security. The skewness and kurtosis are produced with the data to understand the normal distribution of the dataset and indicate the outliers.

6. Evaluation

6.1 Frequency Table Analysis

The sample size for the methodology is 102. The total number of respondents for the survey were 102 participants among them 52 were male and 50 were female respondents. The demographic analysis included variables such as age, gender, education, employment status and location of the selected population.

Age Frequency Table

Age	Frequency	Percent	Valid Percent	Cumulative Percent

Under 18	2	2.0	2.0	2.0
18 to 24	58	56.9	56.9	58.8
25 to 34	25	24.5	24.5	83.3
35 to 44	6	5.9	5.9	89.2
45 to 54	7	6.9	6.9	96.1
55 to 64	4	3.9	3.9	100.0
Total	102	100.0	100.0	

Table 1: Age Frequency Table

Source: Survey Data, 2024

The age group of 18 to 24 shows the dominance of respondents in the sample size of 102 with the highest percentage of 56.9. This is followed by the age range of 25 to 34 amounting to 24.5 percent. Together, they form the majority of 81% of the total respondents, indicating a stronger skew towards the younger demographic. Less than half of the respondents are in the older age group of 35 to 44, 45 to 54 and 55 to 64 with 5.9%, 6.9% and 3.9%, respectively. The cumulative percentage shows a steady accumulation across all the age groups, covering the total sample of 102 respondents by reaching 100% in the final category. In summary, the focus of the survey's conclusion is derived from the younger population.

Gender Frequency Table

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Male	52	51.0	51.0	51.0
Female	50	49.0	49.0	100.0
Total	102	100.0	100.0	

Table 2: Gender Frequency Table

Source: Survey Data, 2024

The Gender Frequency table shows the count of males and females who participated in the survey. Out of 102 participants, 52 are male and 50 are female, an equal distribution.

Education Frequency Table

Education	Frequency	Percent	Valid Percent	Cumulative Percent
Secondary Education	3	2.9	2.9	2.9
Higher Secondary	6	5.9	5.9	8.8
Bachelor's Degree	57	55.9	55.9	64.7
Master's Degree	32	31.4	31.4	96.1
Doctorate	2	2.0	2.0	98.0
Other	2	2.0	2.0	100.0
Total	102	100.0	100.0	

Table 3: Education Frequency Table

Source: Survey Data, 2024

The highest percentage is shown by the bachelor's degree students with 55.9 per cent. This is followed by respondents with a master's degree 31.4 per cent. Together, they make up 87.3% of the sample size. The dominant educational background of the participant is a Bachelor's and Master's Degrees. The smaller portion is divided among secondary education with 2.9, higher secondary with 5.9, doctorate and other with 2%, respectively. This interpretation provides further implications of educational influence on responses. To broaden financial inclusion, practitioners can target people with lower levels of education.

Employment Frequency Table

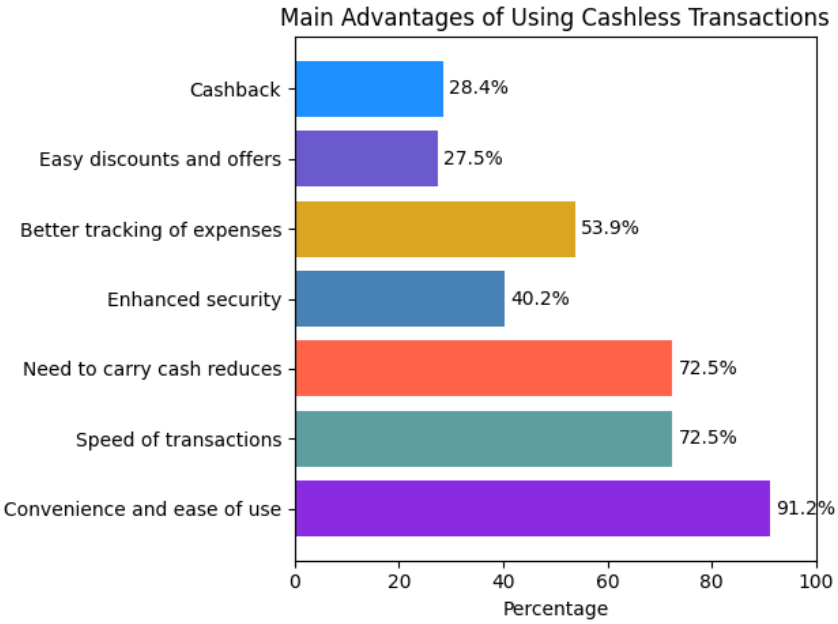
Employment	Frequency	Percent	Valid Percent	Cumulative Percent
Employed	48	47.1	47.1	47.1
Self-employed	13	12.7	12.7	59.8
Part-time	6	5.9	5.9	65.7
Unemployed	4	3.9	3.9	69.6
Student	30	29.4	29.4	99.0
Retired	1	1.0	1.0	100
Total	102	100.0	100.0	

Table 4: Employment Frequency Table

Source: Survey Data, 2024

The frequency table gives the percentage and frequency of the employment status of the participants to understand how employment can impact the adoption of cashless transactions in India. The sample size included the respondents with 47.1 percent being employed. This shows that the survey sample includes a population which are potential customers having disposable income. Hence, this made them the appropriate sample size to learn about the adoption rate of cashless transactions among the employed participants. The sample size of students is quite high, with 29.4 per cent. This helped to check the popularity of cashless transactions among the students.

6.2 Bar Chart Analysis



Bar Chart 1: Advantages of Using Cashless Transactions

Source: Survey Data, 2024

The bar chart illustrated the perceived main advantages of using cashless transactions by the survey respondents.

Convenience Factor: Around 91.2% of respondents believed that using cashless transactions is easy and convenient. The ease of use of digital transactions attracts unaccustomed users.

Speed of Transactions: The percentage of 72.5 values the quick processing time of cashless transactions which is considered as a crucial factor in today's fast-paced environment.

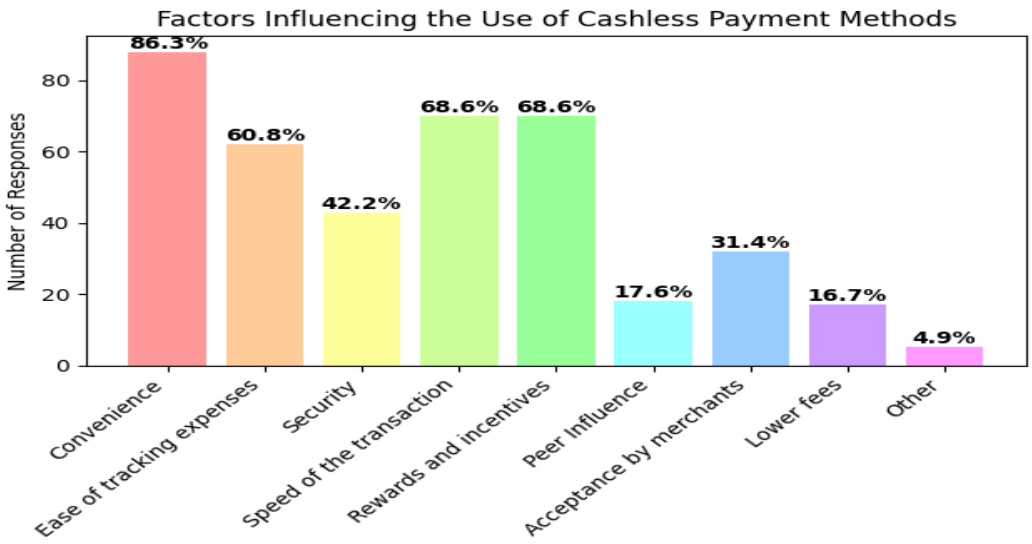
No need to carry cash: Similarly, the need to carry physical cash is eliminated after using cashless transactions which further adds the convenient factor to the CLT.

Enhanced Security: Over 40% of participants had security of cashless transactions as a key factor, this is significantly lower compared to convenience and speed. Additionally, these statistics reflect ongoing concerns about payment security.

Better Tracking of Expenses: More than half of the respondents find that cashless transactions application helps in tracking personal finances.

Easy Discounts, Offers and Cashbacks both provide financial incentives to the customer of cashless transactions. The benefits of cashless transactions are provided by the company to attract more users. Although people do not perceive it as beneficial as a convenience and speed factor. These incentive strategies are implemented to attract and retain users. In conclusion, the financial incentives are negligible or less significant for the users compared to the appeal of convenience and speed factor.

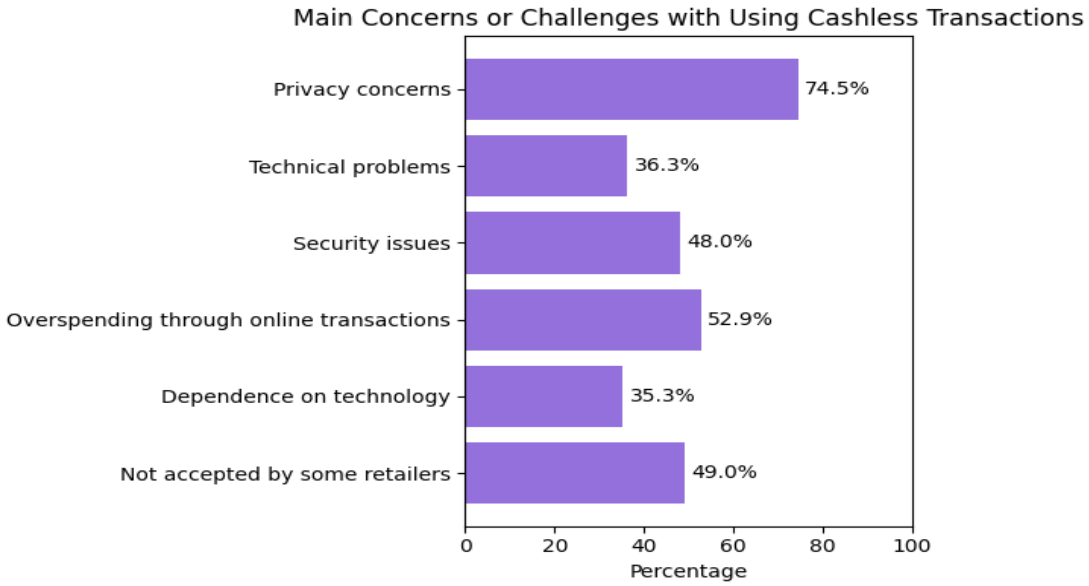
Factors Influencing the decision



Bar Chart 2: Factors Influencing the Use of Cashless Payment Methods

Source: Survey Data, 2024

The bar chart visualizes the factors that influence the decision of consumers to opt for cashless payment methods. The influential factor was convenience factor followed by ease of tracking expenses, which is done using mobile wallet applications. The list of factors that contribute to the adoption rate of cashless transactions are convenience, ease of tracking expenses, security, speed of the transaction, rewards and incentives, peer influence, acceptance by merchants and lower fees.

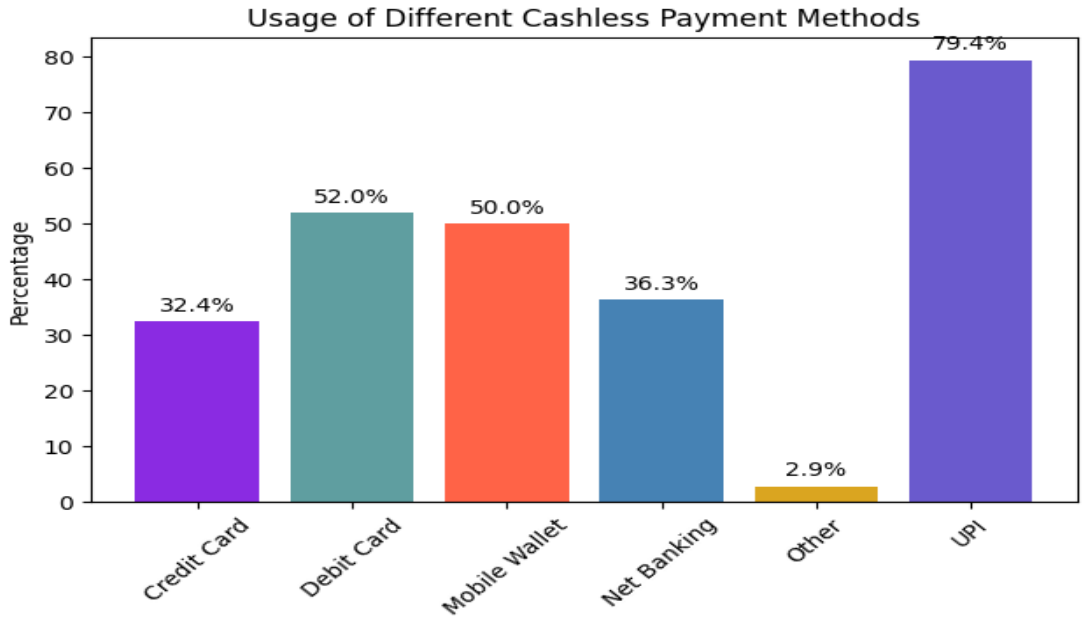


Bar Chart 3: Main Concerns or Challenges with Using Cashless Transactions

Source: Survey Data, 2024

The challenges perceived by the consumers while using cashless transactions.

The horizontal bar chart shows the main concerns the consumers face while using cashless transactions. 3 quarters of respondents (74.5%) are concerned about the privacy of their financial or personal data. This can imply that individuals can have trust issues with the usage of online transactions if they perceive it as a threat to their privacy. The significant respondents (52.9%) are concerned about the cashless transactions making them overspend, due to the convenience of digital payments and impulse buying. This can further lead to dependence on technology (35.3%) for making payments which can be troublesome if the technical issue is encountered. These further explain the challenge of technical problems, connectivity issues are genuine concerns of over 36.3% regarding digital payments, implying that the infrastructure of the technology used to handle the cashless transactions can often be unreliable or lagging. Security issues are notable concerns perceived by 48% users indicating that relative frauds and information threats can take place. Another problem of cashless transactions is due to complexity and difficulty where few retailers refrain from accepting the money online, emphasizing the barrier of the broader adoption by the merchants and retailers. The low acceptance rate of online transactions is mostly seen in rural or lesser-developed areas.



Bar Chart 4

Source: Survey Data, 2024

The most popular method is through UPI (Unified Payment Interface), around 79.4% of respondents use UPI. The high usage rate implies wide acceptance across vendors and different platforms. The second most popular method to transact money is Debit Card, with 52.0% of consumers believing that it is convenient to insert or tap the card.

Mobile wallets like Phone Pe and Paytm are user-friendly applications used to pay and transfer money online, gaining over 50 % responses. The Net Banking and Credit Card is used by over a third of the respondents.

6.3 Cross Tabulation Analysis

Awareness of Government Initiatives Promoting Cashless Transactions in India * Effectiveness of Government Initiatives in Promoting Cashless Payments Adoption Crosstabulation

Perceived Effectiveness of Government Initiative in Promoting Cashless Payment Adoption	Very Effective	Effective	Neutral	Not Effective	Total
Awareness of Government Initiatives					
Yes	18	52	6	1	77
No	4	9	12	0	25
Total	22	61	18	1	102

Table Number 5: Cross Tabulation

Source: Survey Data, 2024

Chi- Square Tests

	Value	df	Asymptotic Significance (2-Sided)
Pearson Chi-Square	21.228[a]	3	< 0.001
Likelihood Ratio	18.781	3	<0.001
Linear-by-Linear Association	7.426	1	.006
N of Valid Cases	102		

a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is .25

Table Number 6: Chi-Square Tests

Source: Survey Data, 2024

The cross-tabulation and Chi-Square Tests is conducted between the awareness of Government initiatives promoting cashless transactions in India and followed by its effectiveness. The questionnaire asked the participants to answer in yes and no about them being aware of government initiatives like Digital India to move towards a cashless society

and another question followed was if they think the government promoting cashless payments will have any effect on the adoption rate.

Cross Tabulation Analysis: Yes (Awareness): The respondents who are aware of the initiatives are around 18 and 52 participants find them “very effective "and “effective” on the scale. The positive responses for the awareness of the Digital India Campaign. This is further attributed to the positive perceived effectiveness of the government initiative which will incline the population to adopt.

Chi-Square Test Results

Pearson Chi-Square: Asymptotic significance (p-value) of less than 0.001 and a value of 21.228 with three degrees of freedom strongly suggests a statistically significant relationship between the two variables which are “Awareness of Government Initiatives” and “Perceived Effectiveness of Initiative in the adoption.” Further, the likelihood test ratio of 18.781 validates the relationship between the variables. The linear-by-linear association with a value of 7.426 and a p-value of 0.006 signifies the upward and linear trend. If awareness increases, the perception of effectiveness and eventually the rate of cashless transactions will go up. In conclusion, the government initiatives towards cashless transactions will have a positive effect on the adoption rate of consumers and users.

Descriptive Statistics

	N Statistic	Minimum Statistic	Maximum Statistic	Mean Statistics	Std. Deviation	Skewness Statistic	Skewness Std. Error	Kurtosis Statistic	Kurtosis Std. Error
Age	102	1.00	6.00	2.7059	1.12213	1.507	0.239	1.635	0.474
Gender	102	1.00	2.00	1.4902	0.50237	0.040	0.239	-2.039	0.474
Education	102	1.00	8.00	5.2941	0.81554	0.189	0.239	2.430	0.474
Employment Status of the Sample Size	102	1.00	6.00	2.5882	1.78194	0.495	0.239	-1.556	0.474
Region	102	1.00	3.00	1.1765	0.40813	2.159	0.239	3.914	0.474
Frequency of Cashless	102	1.00	4.00	1.4510	0.90791	1.970	0.239	2.643	0.474
Level of Trust in Cashless Payment Systems	102	1.00	4.00	2.1275	0.77933	0.156	0.239	-0.549	0.474
Perceived Contribution of Cashless Transactions to Economic Growth	102	1.00	4.00	1.9412	0.80621	0.455	0.239	-0.450	0.474
Impact of Cashless Transactions on Financial Efficiency	102	1.00	3.00	1.1863	0.43895	2.324	0.239	4.924	0.474
Changes in Spending Pattern with Cashless Transactions	102	1.00	4.00	1.4020	0.95710	2.083	0.239	2.643	0.474
Experience of Security Incidents in	102	1.00	3.00	1.7843	0.51947	-0.241	0.239	-0.19	0.474

Cashless Transactions									
Concern for Personal and Financial Information Security in Cashless Payments	102	1.00	5.00	2.2549	1.00184	0.731	0.239	0.474	0.474
Resilience of Cashless Payment Systems to Disruptions and Cyberattacks	102	1.00	4.00	2.4020	0.85896	-0.024	0.239	-0.650	0.474
Awareness of Government Initiatives Promoting CLT in India	102	1.00	2.00	1.2451	0.43227	1.203	0.239	-0.564	0.474
Effectiveness of Government Initiatives in promoting cashless transactions in India	102	1.00	5.00	1.9902	0.69646	0.731	0.239	2.354	0.474
Perception of the Future of Cashless Transaction	102	1.00	4.00	1.2941	0.53747	2.059	0.239	5.577	0.474
Envisioned Role of Cashless Transactions	102	1.00	4.00	2.0784	0.59180	0.274	0.239	0.757	0.474
Valid N (listwise)	102								

Table Number 7: Descriptive Statistics

Source: Survey Data, 2024

6.4 Interpretation of Descriptive Statistics:

Demographic and Regional Characteristics:

Age: The mean statistic is 2.7059 (on a scale from 1 to 6) suggesting most participants fall under the younger age group category. The distribution depicts a right skew (1.507), showing the dominance of younger respondents and a peaked skew of 1.635 validates a concentrated age group.

Gender: The distribution spread of males and females is nearly balanced with a mean of 1.49. The skewness of 0.040 and negative Kurtosis of -2.039 specifies that no one gender dominated the survey. The representation of the male and female is evenly distributed.

Location/Region: Most participants were from urban areas (mean = 1.18). This is further proved by the strong skewness of 2.159. Moreover, high Kurtosis of 3.914 and significant urban clustering.

Behavioral Variables

Frequency of Cashless Transactions: The positive skewness of 1.970 and Kurtosis of 2.643 informed the respondents inclination towards the daily usage of cashless transactions. The analysis implied that there is a high concentration of daily users.

Level of Trust in Cashless Payment Systems: The mean of 2.13 denotes moderate trust level in cashless payment systems.

Economic Contribution: The moderate positive skewness (0.455) along with the mean of 1.94, the participants agree on the positive economic impact of contribution on the economic growth. Although there is a slight negative (-0.450) kurtosis which confirms the varied degree of conviction in beliefs.

Security and Perception Variables: The mean of 1.78 with a slight negative skewness (0.241), validates that only fewer people reported security incidents.

Concern for Security in Cashless Payments: With the mean of 2.25, a skewness of 0.731 and kurtosis 0.474, demonstrating that although concerns are common, they differ amongst responders.

Perception of the Future of Cashless Transactions: The Mean of 1.29 establishes the strong belief in rapid growth of cashless transactions, with extremely high kurtosis (5.577) and positive skewness (2.059), suggesting a concentrated optimism within the population. Although a cashless society is considered, cash still remains the principal factor for most of the survey respondents.

6.5 Discussion

Limitations

The study encountered few limitations while conducting and drafting the research. Since the nature of the study was cross-sectional, it will overlook the future change or trends over a time. Due to the time constraints the research collected the data at a single point or time. The observation of the adoption of cashless transactions over the coming years will be missed in this study. This study limits the possibility of recording the implications of the upcoming modern technologies and new policies regarding cashless transactions.

Sampling Bias

The analysis could be potentially biased since the age group skews towards the younger population's preferences and behaviors. The results cannot be generalized since the population is young. One cannot deny that cashless transactions are a modern phenomenon catering to upcoming consumers and promoting it among established users as well. Additionally, the respondent age categorization could be biased and inaccurate due to the heavy reliance on self-reported data. Moreover, the under-representation of the older age group could hinder the understanding of the entire population.

7. Conclusion

Extensive research was conducted to understand the profound implication of the adoption of cashless transactions on economic efficiency, security, and resilience, in the Indian market. The findings showed that UPI is most adopted and extensively used for its attributes like convenience and speed of transactions. The driving factor of cashless transactions is UPI due to its popularity and its inclusion in Government Campaigns like Digital India. This indeed contributes to economic growth and financial inclusion. Moreover, the study also highlighted privacy concerns, security threats and fraud which might slow the progress of the adoption rate in India. The promotion of Government initiatives, such as the Digi Dhan campaign, indicated a heightened level of public acceptance and readiness towards digital adoption.

Results indicate cashless transactions, and its adoption is leading among the younger generation. The sample size is dominated by the age group of 18-34 which values the speed and convenience of the transactions. There is a strong relationship between higher level of education and adoption rates. Participants with bachelor's and master's degrees are adopting and integrating cashless transactions in their daily lives.

7.1 Future Work

The government can identify the regions and locations where cashless transactions are not popular. And bring in policies that will enhance digital literacy and financial education among the lower-level areas. The study conducted highlights the privacy and security concerns are one of the major barriers to the adoption of electronic payments systems. The policy makers can create effective measures and ensure the security of cashless transactions. By enforcing stringent data protection regulations and implementing reliable authentication methods to safeguard the data of the users. Conduct further longitudinal studies to understand the user's adoption rate over the time.

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