CHAPTER 1 Introduction

Preview

The current chapter provides an overview of the research undertaken to understand the adoption of mobile payments. The innovation development process starts with the identification of an existing problem and offers a solution through rigorous research and development of a method or product. The innovation is considered successful if it is adopted by the target population. Although adoption or rejection is generally the last step of this process, they hold the maximum significance. In section 1.1 the emphasis is on why it is important to study technology adoption in general followed by the focus on the recent developments in the domain of mobile payments and its significance in section 1.2. Having the technology alone won't help to solve the problem but is contingent upon whether there is necessary infrastructure available to support its effective implementation which is presented in section 1.3. The next section is devoted to the exploration of the evolution of digital payment in India followed by section where the focus is where India stands with respect to other countries. Section 1.5 presents the aims and objectives followed scope in section 1.6 and methodology in section 1.7 and concludes with the overview of the thesis in section1.8.

1.1. Technology Adoption and Its Significance

Recent progress in the field of information and communication technologies (ICT) has provided a fresh impetus to the innovation in new business models, security and privacy, governance, artificial intelligence, financial innovation, and interoperability of systems. These developments are an indication of the fourth industrial revolution (Schweizer et al., 2020). New technologies are critical for the development of any country especially in the financial sector

as it is the main driver for economic growth. The relationship between financial development and economic growth was first proposed by Joseph A. Schumpeter, where he signified the necessity of a developed financial system to achieve economic growth (Schumpeter, 1934). This viewpoint was also supported by other authors (Goldsmith, 1969; McKinnon, 1973; Shaw, 1973). Economic growth is primarily attributed to the increase in wealth, labour force, output, and income but it is also crucial to include the factors of credit dissemination and accumulation of financial assets (Gurley & Shaw, 1955). These traditional functions can be optimised by the recent development in payment technologies. But, to implement this innovation in digital payment it is absolutely necessary for a country to have adequate digital infrastructure. The Digital India initiative was launched by the government of India in 2015 with a focus on facilitating digital infrastructure, services, and empowerment to its citizens (*Digital India*, 2015). Digital India initiative aims to create a knowledge-based economy where its citizens can have access to the digital infrastructure to facilitate trade, communication, and financial inclusive activities. Remote areas of the country which were neglected due to inadequate infrastructure are now being able to connect to the mainstream economic activities. The government has also provided support to companies to set up manufacturing facilities in the country to produce electronic equipment. The manufacturing of mobile phones and other digital products would decrease the reliance on other countries and create an ecosystem for future growth and innovation. A major milestone of the government is to create a one trillion economic value. To achieve this goal, thirty different schemes are launched covering nine areas with the aim to increase productivity and improvement of quality of life. These nine areas are to improve information technology infrastructure and software capability, healthcare, education, energy security, new generation financial services, e-governance, doubling farmers'

income and, to create facilities for manufacturing as well as software products for export (MEI&T, 2019).

1.2. Mobile Payment Technology and Its Significance

Mobile phones have outgrown their intended purpose of use and due to continuous innovation and development, it offers many value-added services. The most popular services available on mobile phones are the access to internet, digital payment systems, global positioning service (GPS), fitness trackers to name a few. The current study focuses on the formation of user's intention to adopt mobile payment services in India. Dahlberg (2008, p. 165) defined mobile payment as "*payments for goods, services, and bills with a mobile device (such as a mobile phone, smart-phone, or personal digital assistant (PDA)) by taking advantage of wireless and other communication technologies*". They further clarified that "*a mobile payment is carried out with a mobile payment instrument such a mobile credit card or a mobile wallet*" (Dahlberg et al., 2015, p. 265). This study adopts the definition of mobile payment based on the the recommendation of Dahlberg et al. as it offers the most comprehensive explanation. Table 1.1 presents the definition of mobile payment suggested by various authors.

Table 1.1 Mobile payment definitions

Source	Definition
(Karnouskos & Vilmos, 2011, p. 3)	"Any payment where a mobile device is used in order to initiate, activate and/or confirm this payment can be considered as a mobile payment"

(K. Turowski & Pousttchi, 2004, p. 5)	"It is a type of electronic payment transaction procedure in which at least the payer employs mobile communication techniques in conjunction with mobile devices for the initiation, authorization or realization of payment"
(Donner & Tellez, 2008, p. 318)	"Various initiatives use mobile phones to provide financial services to 'the unbanked.' These services take a variety of forms (Including long-distance remittances, micropayments, and informal airtime bartering schemes), and go by various names, including mobile banking, mobile transfers, and mobile payments."

The origin of mobile payment systems can be traced back to Finland, 1997 when Coca-Cola accepted digital payments through short message service (SMS) for its vending machines (Dahlberg et al., 2015).

Associated benefits of using mobile payment applications are described as follows:

- Mobile payments act as a safe and easy alternative to cash and is preferable for micropayments.

- These applications can store the financial details of an individual in a secure way for faster processing.

- A ubiquitous feature of payment apps fosters real-time tracking of financial assets

- Helps in easy facilitation of micro credits through automation for individuals

- Digital payment applications help in the financial inclusion of the impoverished section of the society by augmenting the scope of providing welfare schemes from the government with minimal cost.

Adoption of a technology is contingent on the favourable conditions or infrastructure availability, usefulness of that technology to solve existing problems or optimisation of existing process and perception about the new technology.

1.3. Exploratory analysis of the macroeconomic factors

New technology adoption is dependent on the availability of adequate infrastructure facilities (Iman, 2018; Ozcan & Santos, 2015; Tilson et al., 2010) and technological support (Huang et al., 2020). This section explains in detail the prevalent infrastructure facilities available in India to support mobile payment systems, implementation of technological innovation to support mobile payment systems and an overview of how India fares with respect to other countries.

1.3.1. Infrastructure Facilities

The key indicators of favourable conditions for the wide use of mobile payment applications are availability of basic banking facilities, access to affordable mobile computing devices, low cost of internet services

- Banking Facilities

A key aspect of digital payments is the availability of infrastructure necessary for adoption. Traditional banks should serve as a key service provider for digital payments, as it is necessary to have a bank account to send or receive payments. The number of bank branches can serve

as a proxy measure for the required infrastructure support. There has been significant growth in the total number of bank branches in India. Compared to just 57,285 branches in March 2003 the number has more than doubled to 128,391 branches in March 2020 with a compound annual growth rate of 6%, Figure 1.1 shows the year-on-year increase of bank branches over a period of 15 years.

Bank accounts not only serve as a key indicator for accessibility to digital payments but also as a tool for financial inclusion. The Indian parliament enacted Aadhaar Act on 11 March 2016 (*The Aadhaar Act*, 2016). This legislation helped individuals without any other forms of identification documents to open a bank account and avail the social benefits schemes of Govt. of India.
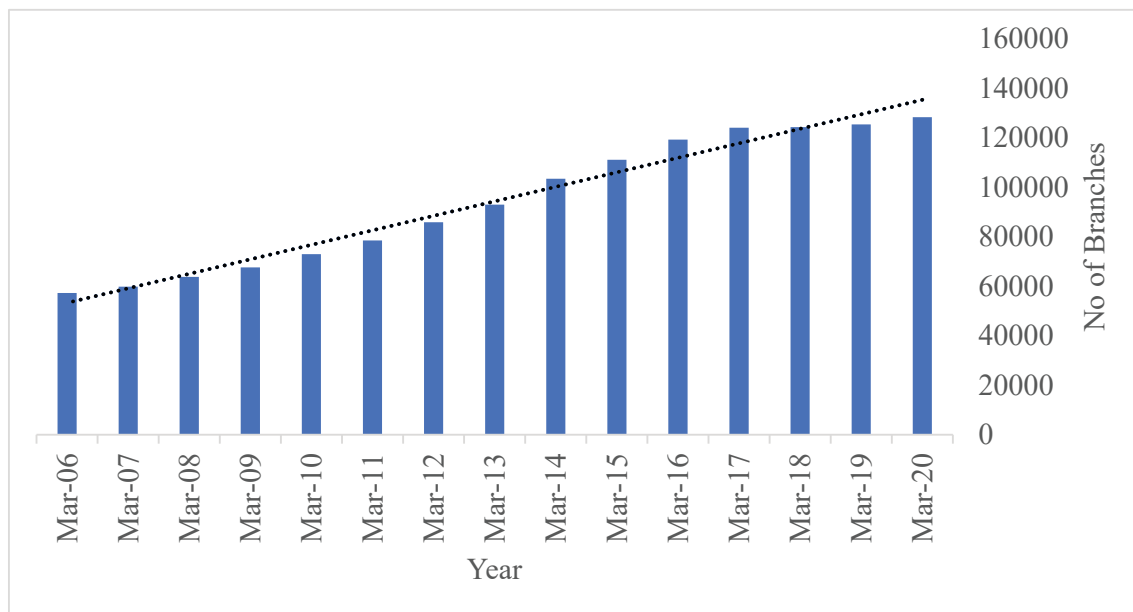

Figure 1.1 Total number of bank branches in India

Source RBI

- Telecom Infrastructure

Smartphones are the basic and the most cost-effective devices to avail digital services. A low-cost smartphone is an ideal device due to its small size and satisfactory computing power. These features help to access the traditional telecom services and the internet. Smart phone prices are on a decline from an average price of ₹17,000 in the year 2010 to ₹10,000 in the year 2015 (Statista 2020, 2020). According to Internet Data Corporation (IDC), The average price for a majority (73%) of the smartphone shipments globally is under ₹30,000 with average entry-level smartphones are priced around ₹7,500 (IDC Report, 2020).

Telecom Regulatory Authority of India (TRAI) periodically publishes the user base for telecom and internet subscribers. Figure 1.2 presents a graphical overview of the active user base in India. The bars represent the user base of mobile subscriptions for urban and rural India, initially, the digital divide was 272.63 million but has subsequently decreased to 119.21 million in 2020. The total subscribers for mobile and broadband internet are represented by lines in figure 1.2, which shows the rising popularity of these services. A possible reason for the high level of adoption for mobile internet could be the cheapest data tariff available in India.
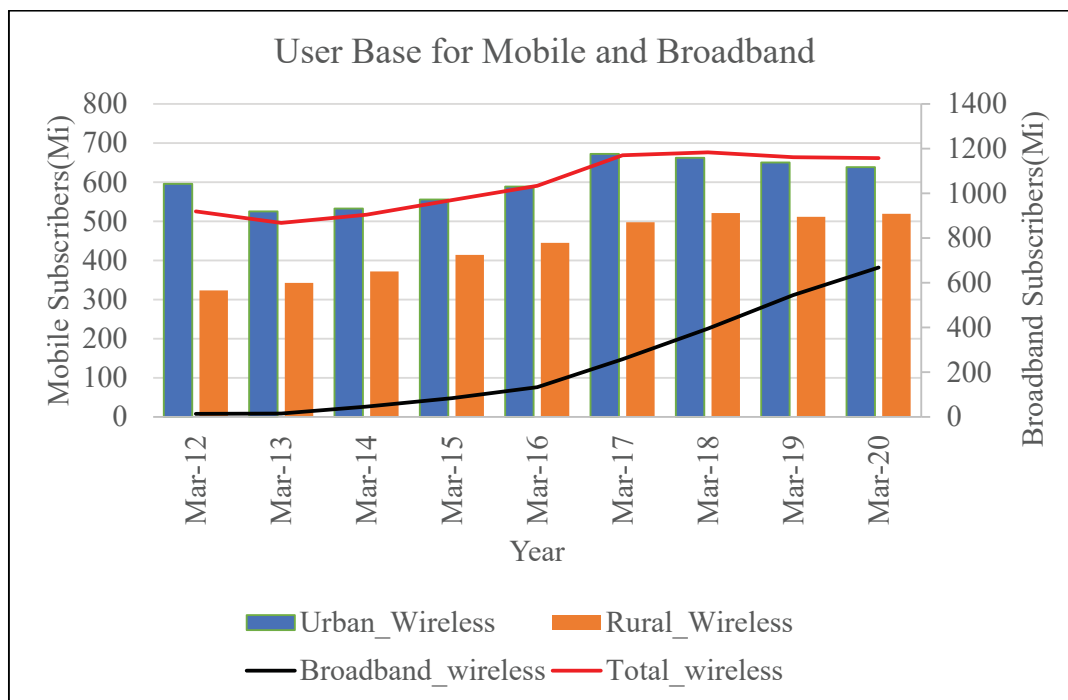
User Base for Mobile and Broadband

Figure 1.2 User base for mobile and internet

Source TRAI

1.3.2. Technological Innovation

The technology for digital payments varies according to the nature and type of payments. Retail and wholesale are the two prominent categories of payments. Retail payments capture the transactions between individuals and organizations and are usually of high volume and low value but wholesale payments reflect the transactions like interbank settlements, foreign exchange carried out between the financial institutions (Bech & Hancock, 2020).

The payment cycle starts from a bank account through a service channel (e.g., mobile application and payment instrument) and is routed to a payment service provider or an automated clearing house for final settlement through the transfer of funds. These settlements are done in a batch and are known as real-time gross settlement (RTGS) but at times due to

insufficient funds of the payment service provider the settlements are canceled or queued to be cleared later, these settlements are known as deferred net settlements (DNS) (Bech & Hancock, 2020). Traditionally RTGS was applicable to wholesale transactions only but recently fast payment systems (FPS) are implemented for retail transactions.

In India Retail payments are managed by the National electronic fund transfer (NEFT), immediate payment services (IMPS), unified payments interface (UPI), Prepaid payments interface (PPI), cards acceptance infrastructure, while wholesale payments are managed by RTGS. NEFT and RTGS are the preliminary payment infrastructure, and the settlement is done in batches.

But due to the recent meteoric rise of digital payments, these methods are not suitable for retail transactions where it is needed to have settlement in real-time. IMPS, UPI, and PPI are implemented to cater for these needs (Kant & Dhal, 2019). Table 1.2 represents the timeline of major digital payment technology implementation in India

Table 1.2 Major milestones of digital payment systems in India

Technology	Year	operator	Description
Electronic Funds Transfer	1997	RBI	The first system implemented in India for transfer of funds but now has been discontinued
Real Time Gross Settlement (RTGS)	2004	RBI	Caters to the wholesale payments in India. The minimum transferable amount is ₹ 2 lakh and is available on working days
National Electronic Fund Transfer (NEFT)	2005	RBI	Fund transfer system with 30 minutes net settlement and are available on working days.
National Electronic Clearing Service (NECS)	2008	RBI	Has two variants, NECS (credit) and NECS (Debit). Used for bulk and repeated payments
Credit & Debit Cards	2009	Banks	Used for cash withdrawal and making payments for goods and services.

PPIs (Cards & Wallets)	2009	PPI Operators	Allows for transaction for the value stored in these instruments.
IMPS	2010	NPCI	Immediate money transfer facility and is available 24x7.
NACH	2011	NPCI	Similar to NECS and available for bulk transactions.
Aadhaar -enabled Payment System	2016	NPCI	Helps to conduct money transfer and withdrawal from micro-ATMs using Aadhar linked bank accounts.
UPI	2016	NPCI	Money transfer facility with an upper limit of ₹ 20,000.
Bharat Bill Payment System	2017	NPCI	Caters to all the utility related bill payments

Source: Adapted from (Kant & Dhal, 2019)

1.3.3. India's Position Among Its Global Peers

- Cash Circulation as Percentage To GDP

Cash among other asset classes can be an indicator of the popularity of digital payments. If the cash circulation forms a significant chunk of gross domestic product (GDP) then it is safe to assume that cash is still preferred over digital currency but, it is not always true.
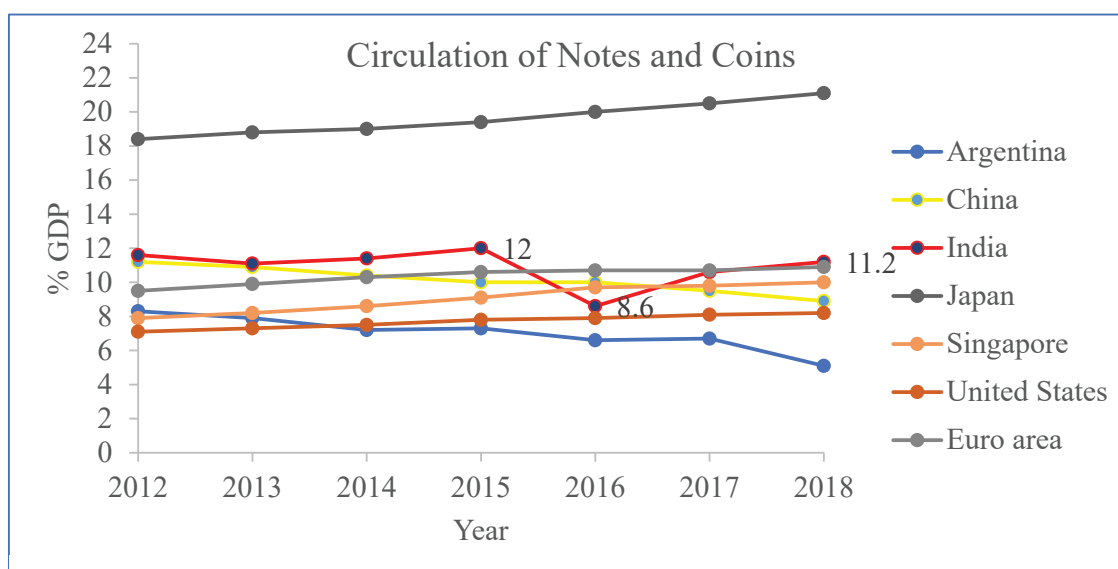

Figure 1.3 Circulation of Bank Notes and Coins as percentage of GDP

Cash can be an attractive investment if the economic growth is on a decline and rather than investing in other asset classes, cash can be a safe alternative. Figure 1.3 shows the cash and coin circulation as a percentage of GDP for a few countries. There has been an increasing trend in the developed countries to prefer cash and similar trends can be found in India with the exception of year 2016, when the government of India implemented demonetization measures to declare all the ₹ 500 and ₹ 2000 notes illegal on 8 November 2016. India is on a growth trajectory in terms of using cash over digital currency and might even surpass the pre-demonetization levels by the year 2020. A possible explanation for cash demand in developed economies could be the slow growth rate in these countries and with a negative interest rate in the eurozone and Japan, holding on to cash seems a logical step. Euro and Yen are the world reserve currency and investing in these asset classes can also be a safe haven to avoid erosion of asset value. China has decreased its reliance on cash over time and with the presence of some influential fintech companies is truly progressing towards a cashless economy. Companies such as Ant technology, WeBank, Lakala, Lufax, Jiedaibao have rapidly acquired unicorn status and are leading the financial innovation in China. The only anomaly is the high cash circulation in Singapore which has a significant fintech presence.

- Average Data Tariff

A survey conducted in 228 countries found that India has the lowest tariff per gigabit (GB) of data. The cost for 1 GB of data is around ₹ 7 In India (Cable.co.uk, 2020). Lowest data tariffs would further reduce the barriers for the adoption of digital payments.

- Tele Density

Telecom density is measured as the total number of mobile subscriptions per 100 persons. It signifies the robustness of mobile infrastructure and helps to give an idea about the popularity of mobile services. Figure 1.4 provides a comparison between India and major economies of the world. The penetration of mobile services has increased over the years, but India still lags behind the developed countries of Europe and North America. There is a significant gap in mobile density with respect to the global average. A rising economy that aspires to achieve economic prosperity like its developed counterparts needs to bridge this gap. India only has a better performance compared to low-income countries.
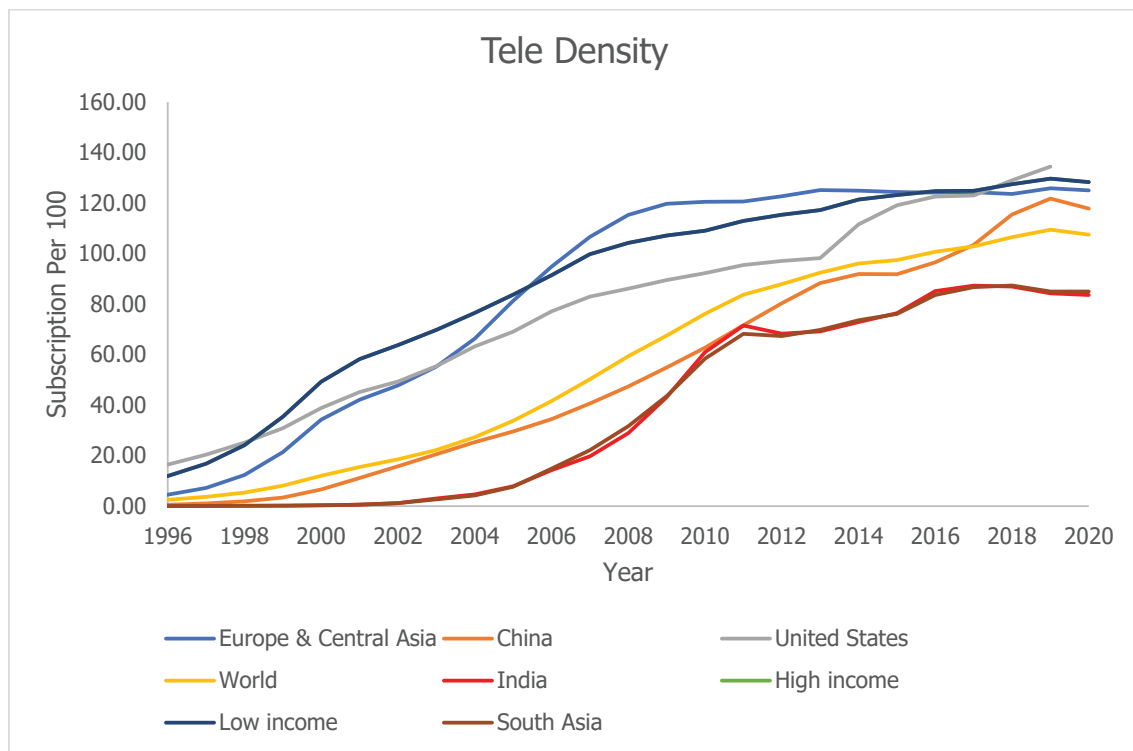

Figure 1.4 Mobile subscription per 100 persons

Source: World Bank

- Financial Inclusion

Financial services help poor families invest in health, education, business, and access to the government's social benefit schemes. These measures are useful tools to reduce poverty (Demirguc-Kunt et al., 2018). India has improved its position in financial inclusion in the year 2017 by providing bank accounts to 80% of the population aged above 15 years compared to a dismal 35% in the year 2011. The Findex survey's findings have some critical insights as the reason for not having a bank account among them are the non-availability of financial institutions in close proximity (23%), financial services are too expensive (27%), and lack of trust in the financial institutions (20%).

- Network Readiness Index

The Network Readiness Index (Dutta & Lanvin, 2020) is an overall score by taking into consideration the technology, governance, people, and impact aspect. The network readiness index assesses the preparedness of a country to be future-ready for using digital technologies. The internet has become a quintessential tool for various countries by offering support for innovation, reaching new markets, fostering global collaboration, and technological development. Digital transformation is completely different from just adopting a particular technology. Digital transformation measures the implementation of digital technology in four areas such as business process innovation, business model, domain, and cultural/organizational. In the year 2020 India is raked 88 on the overall score and is behind its South Asian neighbours. This metric shows that India faces challenges in availing access to information technology to its population. China on the other hand is ranked 44 and is having better success at transforming digital technologies.

1.4. Problem Statement

To summarise the exploratory research conducted in the previous sections, there is ample evidence for the demand for mobile payments. Total digital payments have increased from 23.3 billion transactions in 2018-19 to 43.7 billion transactions in 2020-21 (RBI, 2021). Similarly, the number of bank accounts have exploded in recent years and also there has been significant improvement in the technological development through infrastructure development. The higher number of bank accounts not only helps to bridge the digital divide but also helps to offer financial inclusion to a larger section of the population. Further barriers to the adoption of mobile payment are removed by the availability of low-cost mobile phones and internet data charges. Taking a cue from these developments it is expected to decrease the reliance on the use of cash in the economy. But with time we have observed a trend for greater affinity towards the use of cash. In India the cash to GDP ratio has also peaked at 14.7% for 2020-21 (Adhikari, 2021).This begs the question of why is it that cash is still the preferred mode for conducting a financial transaction in India. The next logical step to investigate this anomaly is to investigate the behavioural aspect of using mobile payment. The next section sets the aims and objective of the research which we aim to accomplish.

1.5. Aims And Objectives

The aim of the research is to learn more about how people use mobile payment applications and explain the variance in the behaviour.

The objectives are described as follows:

a) To identify the variables that could influence the dispositional intention to adopt mobile payment applications in India.

b) Propose and test a causal model to explain the maximum variance in the propensity to use mobile payment apps for Indian users.

c) To see how government policies and demographic variables affect people's willingness to use mobile payment applications.

1.6. Scope of the study

The current study is an attempt to further our understanding of the mobile payments' adoption in India. Various definitions of mobile payments are discussed in section 1.2 and hence we have used only technologies such as credit/debit cards, internet banking, mobile wallets and applications. The purpose of this research is to investigate the adoption of mobile payment from a consumer perspective and is not directed towards how institutions such as government agencies and companies adopt them. We are also not investigating the general preference of mobile payment services provided by certain vendors but to understand the overall perception of mobile payment as technology from a consumer context.

1.7. Methodology adopted in the study

- **Partial least square- structural equation modelling (PLS-SEM)**

The data is analyzed using variance-based structural equation modelling to estimate the relationship between the factors responsible for intention to adopt mobile payments. The data collected is non-normal other statistical methods that are dependent on the assumption of normality in the dataset cannot be applied.

- **Necessary condition analysis (NCA)**

NCA complements the results obtained from PLS-SEM. Structural equation modelling can identify the factors which are sufficient to increase the level of adoption of mobile payments. But to foster the use of mobile payment in the first place it is essential to identify the must have factors.

1.8. Overview Of the Thesis

This section mentions the chapter-by-chapter synopsis of the thesis. **Chapter 1** provides an overview of how innovation can be adopted and selected three criteria to explain it. The three criteria are adequate infrastructure availability, appropriate technological support to solve existing problems and finally the general perception about the innovation (Karahanna et al., 1999; Moore & Benbasat, 1991). The thesis in the subsequent chapters will explore more on the third criteria mentioned above. **Chapter 2** covers the prominent theories and models on technology adoption in information systems along with the factors affecting the intention to adopt. A section is devoted to identifying the existing gap in the literature.

The proposed model and hypothesis with literature support are presented in **chapter 3**. **Chapter 4** presents the research question and dictates the selection of appropriate paradigm and research methods to conduct the study. From the exploration of the relevant paradigms used in information system research positivist paradigm is selected. Data collection, sampling techniques and the possible statistical methods are also discussed in the same chapter.

Chapter 5 provides a detailed account of the statistical methods used to test the proposed extension to UTAUT2 and the hypothesis. PLS-SEM is used as it is not dependent on any distribution assumption and can be used for the complex model without any copious amount of data required to perform the analysis. A new moderator and its effect are also tested, further,

the possible difference in adoption pattern due to demographic variables are also analysed. **Chapter 6** is on discussing the managerial, social and policy implications due to the results obtained and finally conclude the chapter with limitation and future scope of the study.

It is necessary to understand how the end-users adopt mobile payments in India as it offers better resource utilization, facilitates trade and commerce, and helps in financial inclusion. This chapter offered a brief overview of the research undertaken. The next chapter explores the available literature on mobile payment adoption in detail.