

## CHAPTER 4 Methodology

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### *Preview*

This chapter provides an overview of the planning and execution of the study. Research methodology deals with the various aspect of how to collect data and analyze them to offer insights. Section 4.2 explains the research question that the study intends to answer, followed by the research paradigm where it is important to specify the approach needed to choose a research design and the subsequent research methods needed to collect data. Section 4.6 explains how the variables included in the proposed model are measured. The next section explains the selection of the sampling frame and sample size. Section 4.8 explains the data collection process in detail, followed by the section on ethics, details of the pilot study conducted, and finally, the statistical techniques and the software used to implement them.

### **4.1. Introduction**

The most important aspect before conducting any research is defined by the questions that we set to address and find their appropriate answers. These questions are set by exploration of extant literature or/and by the researchers' experience and motivation. This aspect dictates the future course of action for the study.

The research paradigm specifies the methods that can be used to collect information. The next step is to specify the research design and constructing a research instrument and calculate the sample size required to analyse the data. The data collected through the appropriate methods are analysed for inferences and recommendations. Figure 4.1 provides a pictorial representation of the research process followed in the study.

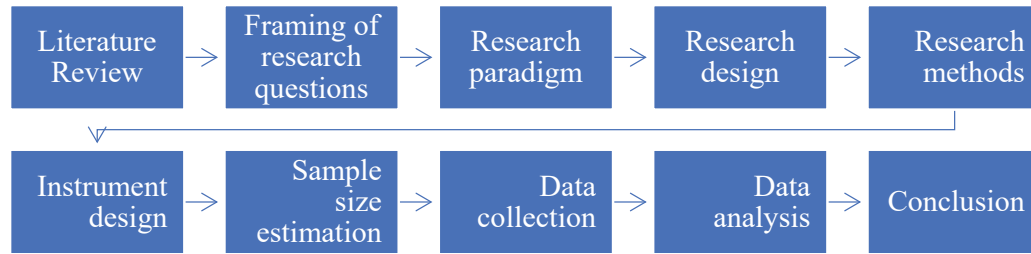


Figure 4.1 Research Process

## 4.2. Research Questions

With the rising popularity and usage of mobile phones and mobile internet, it was imperative to study a functional aspect of using mobile phones. This study will make an attempt to understand the adoption of mobile payment applications in India.

The following questions are studied in detail:

1. To identify the variables that could influence the dispositional intention to adopt mobile payment applications in India.
2. Propose and test a causal model to explain the maximum variance in the propensity to use mobile payment apps for Indian users.
3. To see how government policies and demographic variables affect people's willingness to use mobile payment applications.

## 4.3. Paradigm

Scientific exploration for knowledge/insight is based on the assumptions that the phenomenon under study is ordered, without any randomness and the process to unravel the insight can be done objectively with scientific methods. The three scientific methods are reductionism,

repeatability and refutation (Oates, 2006). Reductionism is the method of parsing certain concepts of importance into their constituent elements. Doing this helps to understand the concept in detail. Repeatability is the process of conducting the experiments repeatedly and checking for any deviation from the original results. This helps to make the findings more robust and can further be used for the development of a theory for the phenomenon. Refutability is the test of resilience for a hypothesis. If the experiments conducted does not satisfy the proposed hypothesis, then it is rejected but, it should be done by using the method of repeatability and if the results are not similar then the theory or hypothesis should be rejected.

The different ontological beliefs set the precedent of how we acquire knowledge. This process of acquiring knowledge is known as epistemological belief or paradigm. “*A paradigm is a set of shared assumptions or ways of thinking about some aspect of the world*” (Oates, 2006). Three prominent research paradigms are positivism, interpretivisms and critical research.

The positivism paradigm uses scientific methods of reductionism, repeatability, and refutation to arrive at conclusion.

Interpretivisms favours multiple versions of reality rather than one truth supported by the positivism paradigm. The interpretation of every individual is different and is subject to change over time. It helps the researcher to examine the phenomenon and individuals associated with it in the real environment rather than any artificially constructed lab setting. But the interpretivisms paradigm is biased due to the subjective evaluation of the researcher and the influence he/she exerts on the environment. The analysis obtained are not objective and cannot be generalised (Oates, 2006).

Critical research is similar to interpretivism but, their similarity ends with the shared view of the world where a certain phenomenon is created and recreated by the individuals associated with it. What makes it different is that it acknowledges the dominant forces like economic, political and cultural factors that create conflict and contradiction in the social system (Oates, 2006).

Positivism is the most popular approach for research as it provides objectivity and has found wide applications in information system research. The objectivity of any approach is established by following a scientific method. A review focusing on the paradigms used in information system research for the year 1991 to 2001 found that positivistic paradigms are the most dominant form as a total of 917 journal articles used it during that time and interpretive paradigm was used in 214 journal articles (W. Chen & Hirschheim, 2004). In our study positivism paradigm is chosen as it is the most popular approach in information systems research. The phenomenon of interest (intention to adopt mobile payment) would be studied using the scientific method of reductionism where the constituting component is Effort Expectancy, Performance Expectancy, Social Influence, Facilitating Condition, Hedonic Motivation, Habit, Perceived Security, Price Value, Task Characteristics, Technology Characteristics and Task Technology Fit.

#### **4.4. Research Design**

The research design for the study is descriptive in nature which tries to evaluate the relationship between one dependent variable (behavioural intention) and twelve independent variables. The two popular methods of descriptive research design are survey research and experiments. The experimental approach lags with respect to the survey in terms of validity and the number of factors that can be studied simultaneously (Boudreau et al., 2001). Survey research is

appropriate when there is a need to quantify the magnitude of various factors on the construct under consideration, without the need to control or interfere with the factors and study the phenomenon in recent past or current time (Pinsonneault & Kraemer, 1993).

The operational definition of the survey in this study is defined as an instrument with a set of structured questions designed to capture information about dispositional attitudes and preferences. Finally, a cross-sectional survey is designed to capture the relationship between the variables that affect the intention to adopt mobile payment applications.

#### **4.5. Research methods**

The methods available for scientific research can be broadly segregated into two categories i.e., quantitative and qualitative. Further introspection will suggest the major methods used in information system research are survey, observation, case studies, and experiments (Whitman & Woszczyński, 2004).

Survey research helps to understand the interrelationships between all the factors and their environments (Goodwin & Goodwin, 2017). Another aspect of survey research is to make inferences about the population based on a statistical test carried out on the sample. (Pinsonneault & Kraemer, 1993) categorised survey research into three categories exploration, description and explanation based on their purpose. Exploration is used if the objective of the researcher is to increase familiarity about a phenomenon that address the issue of what and how to measure. This process helps in the development of concepts, methods, and structured designs for future surveys. Description nature of survey helps to answer how certain phenomenon is happening in a population, with the intention to state the facts and not to test theories. The

The explanation nature of a survey is the most detail-oriented use of the questionnaire as it is used to test theories and hypotheses to understand the causal relationships among the variables under consideration.

Case study research is another empirical method where multiple variables are studied but with few observations. The data collected on the observations are extensive and are covered in detail (Djamba & Neuman, 2002). Ragin & Becker (2009) suggested in favour of the case method when the study intends to understand Individual actions and how they affect large scale structures and processes. Djamba & Neuman (2002) also mentioned six major advantages with the case study as the ability to identify variables, have high learning outcomes and help in theory building (George & Bennett, 2005), establish a causal relationship between the variables used for the study (Gerring, 2017), reduce the complexity of new phenomenon under study (Gerring, 2017), calibration of measures which is a unique aspect for behavioural science (Ragin, 2008), presents a holistic picture of how variables interact with the environment (Klandermans & Staggenborg, 2002). Across case, research is the quantitative variation of case study research where the variables of interest are measured quantitatively for making inferences.

Observational studies are helpful to study the phenomenon when it is happening in real-time and is in a true sense an ethnographic study. These studies can be conducted in fields or laboratory settings and record the interaction of individuals with technology through event logs of software, transcripts from meetings or through access to the related documents. The benefits of observational methods are the favourable access to the research participants, shorter time frame to conduct research, larger sample sizes than case studies. Challenges faced by these

studies can be due to the privacy restrictions, non-representative sample size and subjective evaluation of the researcher (Whitman & Woszczynski, 2004).

Experimental research is quite popular in information system research as it offers a direct comparison of effects between the participants and the phenomenon under consideration. The sample size of these studies is more compared to observation and case study methods. The researchers have more control over the variables in laboratory conditions and can therefore provide a better explanation of a given phenomenon (Whitman & Woszczynski, 2004). But these benefits are not without some challenges. The key issues in experimental research are Participants may change their behaviour due to the knowledge of being watched, the simulated experience for context is not the same as the real-world conditions, few variables can be studied in a laboratory condition.

#### **4.6. Measurement**

The Extant literature suggests thirteen constructs are the key drivers for mobile payment adoption. The proposed model is based on the UTAUT2 model (Venkatesh et al., 2012b) and a total of 45 items were adapted from prior research. Table 4.1 provides an overall summary of the constructs and their total number of items used along with their sources.

Performance expectancy, Effort expectancy, Social Influence, Facilitating Conditions and Behavioural intention are part of UTAUT (Venkatesh et al., 2003) which was proposed to understand adoption behaviour at an organisational setting but when the context is to describe consumer preferences additional constructs were deemed necessary by (Venkatesh et al., 2012b) to explain the adoption phenomenon.

Table 4.1 Summary of constructs and their associated items

Construct	Item	Source
Performance Expectancy (PE)	I find mobile payment useful in my daily life.	
	Using mobile payments increases my chances of achieving things that are important to me.	(Venkatesh et al., 2003)
	Using mobile payments helps me to make payments more quickly. Using mobile payment increases my productivity.	
Effort Expectancy (EE)	Learning how to use mobile payments applications is easy for me.	
Social Influence (SI)	My interaction with mobile payment is clear and understandable. I find mobile payment easy to use. It is easy for me to become skilful at using mobile payment.	(Venkatesh et al., 2003)
	People who are important to me think that I should use mobile payment.	
	People who influence my behaviour think that I should use mobile payment applications. People whose opinions that I value prefer that I use mobile payment.	(Venkatesh et al., 2003)
Facilitating Conditions (FC)	I have the resources necessary to use mobile payment.  I have the knowledge necessary to use mobile payment. Mobile payment applications are compatible with other applications I use. I can get help from others when I have difficulties using mobile payment.	(Venkatesh et al., 2003)



Hedonic Motivation (HM)	Using mobile payment is fun.	(S. S. Kim & Malhotra, 2005)
Price Value (PV)	Using mobile payment is enjoyably. Mobile payment is reasonably priced. Mobile payment is a good value for the money. At the current price, the mobile payment provides good value.	(Dodds et al., 1991)
Habit (H)	The use of mobile payment has become a habit for me. I am addicted to using mobile payment. I must use mobile payment. Using mobile payment has become natural to me.	(Limayem & Hirt, 2003)
Task characteristics (TC)	I need to manage my account anytime anywhere.  I need to transfer money anytime anywhere. I need to acquire account information in real time.	(T. C. Lin & Huang, 2008)
Technology characteristics (TECC)	Mobile payment provides ubiquitous services.  Mobile payment provides real-time services. Mobile payment provides secure services.	(T. C. Lin & Huang, 2008)
Task-technology fit (TTF)	In helping complete my payment tasks, the functions of mobile payment are enough.  In helping complete my payment tasks, the functions of mobile payment are appropriate. In general, the functions of mobile payment fully meet my payment needs.	(T. C. Lin & Huang, 2008)

Perceived security (PS)	<p>I feel secure sending sensitive information across the mobile payment</p> <p>The mobile payment is a secure means through which to send sensitive information</p> <p>I feel secure managing my personal finances with the mobile payment</p> <p>The mobile payment offers a secure means through which to manage my personal finances</p>	(Cheng et al., 2006)
Government Policy (GP)	<p>To what extent are you familiar with the various incentives (Cashback, low transaction fee, No Service charge etc.) offered by the government to adopt mobile payments?</p> <p>I know about the incentives in detail</p> <p>I became aware of the above policies through diverse means including mass media</p> <p>The incentives offered are generous</p> <p>The incentives offered are strongly promoting mobile payments</p> <p>The incentives are efficient to encourage adoption of mobile payment</p> <p>The Incentives offered are necessary to encourage adoption of mobile payment</p>	(X. Zhang et al., 2013)
Behavioural Intention (BI)	<p>I intend to continue using the mobile payment in the future.</p> <p>I will always try to use mobile payment in my daily life.</p> <p>I plan to continue to use the mobile payment frequently</p>	(Venkatesh et al., 2003)

Hedonic motivation, Price Value and Habit were added to the UTAUT model to explain the behavioural intention for consumer technologies. The scale items for Hedonic motivation was adopted from (S. S. Kim & Malhotra, 2005). Price is a critical construct in consumer setting as the individual are responsible for the purchase of their own technology products as contrasted to the organizational context. The scale items for price value is adapted from (Dodds et al., 1991). Habit is a subconscious behaviour and can have a significant effect on the adoption behaviour. The scale items for habit was adopted from (Limayem & Hirt, 2003)

Task technology fit (TTF) was integrated with UTAUT to study mobile banking adoption behaviour (Zhou et al., 2010). But it is more appropriate to integrate TTF with UTAUT. The scale items for task characteristics, technology characteristics and task technology fit were adapted from (T. C. Lin & Huang, 2008).

Perceived security is a relevant construct when people interact with technology products and the associated scale items were adapted from (Salisbury et al., 2001). For the literature review, it was found that government policy was never studied to understand adoption behaviour in information technology products but has been applied to the study of electric vehicles. Taking a cue from these studies the scales for government policy was adapted from (X. Zhang et al., 2013).

A review of methods used in information system research found majority of articles used survey method (60.5%), followed by field study (37.31%) and laboratory experiments (9.7%). The review covers the duration from 2000-2004 (Guo & Sheffield, 2008). All the scale item used in the survey are measured on a 7-point Likert scale of 1 (strongly disagree) to 7 (strongly agree). The response rate of the final survey is 40%. The Complete questionnaire used for the study is provided in Appendix 1A

## 4.7. Sampling Frame and Sample Size

The sample frame consists of all the individuals above 18 years of age who possess a mobile phone and are Indian residents. The individual must also have an active bank account. The sample consists of 500 individuals from whom the data is collected during the survey. A self-selection non-probabilistic sampling strategy is used for the study.

Before conducting the study, a priori sample size determination is required. Cohen's statistical formula was used to compute the sample size as mentioned in the following equation:

$$N = \frac{\lambda}{f^2} \quad 4-1$$

Where N is the sample size,  $\lambda$  is the non centrality parameter and  $f^2$  is the cohen's effect size. The noncentrality parameter  $\lambda$  is dependent on the degrees of freedom of F-ratio, v. The relationship is mentioned in the following equation:

$$v = N - u - 1 \quad 4-2$$

Where, u is the number of independent variables.

To mitigate this problem of unknown value of v as the sample size is yet to be calculated an alternative method is used to use the trail value of v mention in the table 9.4.2 by Cohen (1988).

This helps us to calculate  $\lambda$  using the following equation (cohen, 1988, p. 445):

$$\lambda = \lambda_L - \frac{\left(\frac{1}{v_L} - \frac{1}{v}\right)}{\left(\frac{1}{v_L} - \frac{1}{v_U}\right)} * (\lambda_L - \lambda_U) \quad 4-3$$

The values for  $v_L$ ,  $v_U$ ,  $\lambda_L$  and  $\lambda_U$  can be obtained from the same table 9.4.2.

This process can be automated by the use of G\* software (Faul et al., 2007). Effect sizes are usually small in behavioural science and can range from 0-0.04 (cohen, 1988). The minimum

sample size to detect a medium effect of 0.15 was calculated using the G\* power software and the a priori sample size is 189 observations with a 5% significance level and power of 95%. Figure 4.2 presents the power along with respective sample sizes and it is evident the power level plateaus around the sample size of 240. As the final data set in our study comprises 500 samples it should be deemed adequate enough to make statistical inferences.

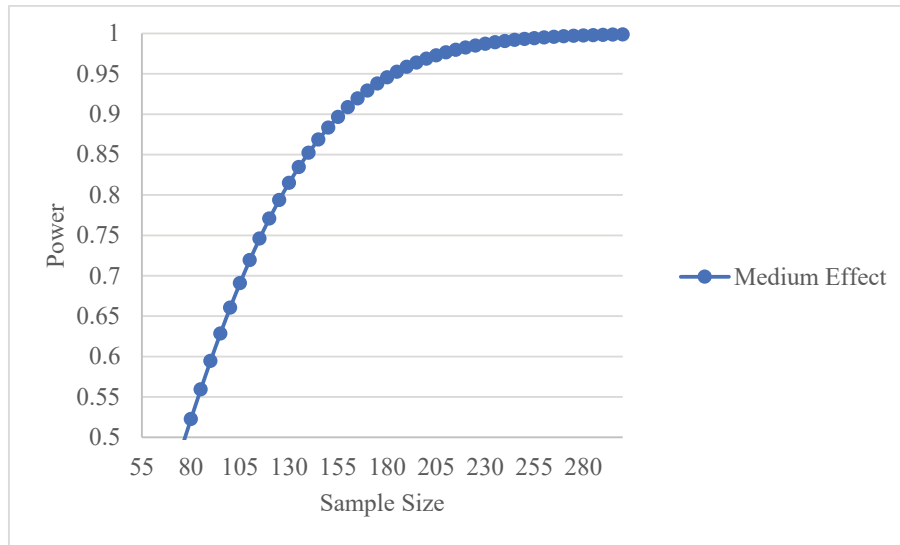


Figure 4.2 Power Plot of medium effect size

#### 4.8. Data Collection

Data was collected from individuals using both online platforms and face to face interviews. Extreme precautions were taken to reduce social desirability bias by promising to keep the identity of the respondents private not including identification questions i.e., mobile numbers and email addresses in the questionnaire. This aspect prohibited conducting a longitudinal survey.

Face to face interview data was taken from respondents from interstate railways stations to have a diverse set of respondents with a wide geographical spread. Similarly, questionnaires

were posted on online groups for travellers to avoid respondents living in a limited geographical area. The questionnaire included attention questions to check for genuine respondents. The questionnaire having wrong answers to the attention question was removed from the final sample. The duration of data collection is from June 2019- August-2020.

#### **4.9. Ethics**

American psychological standards were followed throughout the research (Koocher et al., 2015) especially, Section 8.05 of the ethical code and conduct. Online data collection was in compliance with the European Union general data protection regulation (GDPR) (Blackmer, 2018).

#### **4.10. Pilot Study**

A pilot study was conducted with responses from 50 individuals from the target sample frame. The pilot study was measured on the following three parameters:

The questionnaire was checked for user fatigue. All the responses were timed to check the total time required for completing the questionnaire. The average response time was around 5.5 minutes. Every respondent was asked whether the questionnaire was too long, but the responses were positive, and the designed questionnaire was deemed satisfactory.

The respondents were also consulted for any ambiguous statements in the questionnaire. Overall, the response was positive and minor changes were suggested.

The responses were checked for statistical reliability. The Cronbach's alpha values were above 0.7 and were found to be satisfactory. Table 4.2 mentions the reliability values of the constructs.

Table 4.2 Chronbach alpha value of the constructs

	GP	SI	FC	HM	PV	H	PS	TC	TECC	EE	TTF	PE	BI
CA	0.95	0.97	0.97	0.87	0.87	0.86	0.96	0.93	0.84	0.92	0.92	0.93	0.93

#### 4.11. Statistical Techniques and Softwares Used in The Study

Quantitative research methods are followed in this study. The collected data were checked for missing values and inconsistencies in a respondent's answers. Attention question was used to check for genuine responses. Preliminary analysis was conducted using descriptive statistics to check for patterns and it was found the data was non-normal and it eliminated any statistical methods based on distributions.

A partial least square path modelling method was used to establish causal linkages among the variables. R (R Core Team, 2013) and Adanco (Jörg; Henseler & Dijkstra, 2020) statistical programs were used. In R, PLS-path modelling was implemented using the cSEM (Rademaker & Schuberth, 2020) package.

PLS path modelling is a multivariate statistical method to establish causality among the variables used in the study. Before using the method for estimation, the parameters, reliability, and validity checks were performed on the measurement and structural models. Reliability of the instrument designed can be checked using Cronbach's alpha and composite reliability measures. Convergent validity checks whether the instruments designed to measure the latent construct are capable of explaining the variance in the latent constructs. The next step is to perform discriminant validity analysis on the measurement model to check for uniqueness among the latent constructs, finally, the structural model is analyzed using variance inflation

factor before using the PLS algorithm for parameter estimation. The statistical evaluation of the collected data is discussed in chapter 5.

In this chapter, we discussed how due to positivist paradigm is the most popular paradigm and hence it helps us to use the reductionist method. The reductionist method is the fundamental process where we believe any phenomenon can be split into its sub-components. These subcomponents are measured using a questionnaire and can be further analyzed using PLS-SEM to measure the effect of these sub-components on the phenomenon of interest (mobile payment intention). The next chapter discusses the statistical results in detail.