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**A Study on the effectiveness of Payment Service Providers with its future prospects:
A case Study among the users in Kathmandu Valley**

By

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A THESIS

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DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

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The undersigned certify that they have read, and recommended to the Institute of Engineering for acceptance, a thesis entitled “**A Study on the effectiveness of Payment Service Providers with its future prospects: A case Study among the users in Kathmandu Valley**” submitted by Bipin Paudel in partial fulfillment of the requirements for the degree of Master of Science in Engineering in Technology and Innovation Management.

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ABSTRACT

The rapid growth of technology has empowered almost all sectors. ICT has revolutionized the entire finance sector with the introduction of digital payment system which has enabled us to perform transaction without using cash. The research motivation is to study various factors affecting the Payment System Providers' (PSPs) effectiveness among the users in Kathmandu Valley (consisting three (3) districts: Kathmandu, Lalitpur and Bhaktapur), Nepal and identifying its future prospects. This study also reveals the challenges to PSPs in Nepal with entrance of PSOs with Open Innovation such as Unified Payment System (UPI).

The research was conducted with the response of 405 respondents within Kathmandu Valley with the research instrument as quantitative approach of questionnaire survey. The result of the data analysis revealed that almost 90% of the respondent have used the digital payment systems every day or once a week or once a month, with above 83% of them have used digital payment system 1-2 years or above two years which shows status of adoption of PSPs in Nepal. Furthermore, the role of regulatory body plays a vital role in the future of digital payment sector. In such scenario, analyzing various factors affecting the effectiveness of PSPs helps in the development and innovation of PSPs.

Different statistical analyses were performed to test the significance of the factors that can affect the effectiveness of PSPs. Based on the findings the feature of Cross-border Peer to Peer and Peer to Merchant Transactions has highest positive influence in the effectiveness of PSPs whereas good customer service and Low Transaction Fee & Merchant Discount Rate (MDR) has also positive influence on the effectiveness of PSPs. However, the regulatory constraints and interoperability are found to have negative impact on the effectiveness of PSPs and the security concern has insignificant relationship with the PSPs effectiveness. The study revealed that entrance of UPI with feature of Cross-border Peer to Peer & Peer to Merchant Transactions, real time Customer service, low transaction and MDR can challenge the existing PSPs in Nepal. However, the way forward for the PSPs is that there is a need to find out unique business offerings or diversify the business that can help them in finding their own position or space in the digital payments industry.

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LIST OF ABBREVIATIONS

API	Application Programming Interface
ATM	Automated Teller Machine
CAGR	Compound Annual Growth Rate
COVID-19	Coronavirus Disease 2019
DPS	Digital Payment System
GDP	Gross Domestic Products
IBFT	Inter Bank Fund Transfer
IBM	International Business Machine
ICT	Information Communication Technology
IMPS	Immediate Payment Service
IPS	Internet Payment Service
ISO	International Organization for Standardization
ISP	Internet Service Provider
KYC	Know Your Customer
MDR	Merchant Discount Rate
NCHL	Nepal Clearing House Limited
NPCI	National Payments Corporation of India
NRB	Nepal Rastra Bank
OTG	On The Go
P2P	Peer to Peer
P2M	Peer to Merchant
POS	Point-of-sale

PSO	Payment System Operator
PSP	Payment Service Platform
QR	Quick Response
RTGS	Real Time Gross Settlement
SME	Small Medium Enterprises
SPSS	Statistical Package for Social Science
SWIFT	Society for Worldwide Interbank Financial Telecommunications
TAM	Technology Acceptance Model
UPI	Unified Payment Interface

CHAPTER ONE: INTRODUCTION

1.1 Background

In recent years, mobile banking and digital transactions have become increasingly popular in Nepal. The widespread adoption of mobile technology and a large increase in its use have been spurred by improvements in the field of wireless communication and the growing of penetration of mobile devices which has boosted digital payment or e-payment system helping to make the transaction cashless. Also, the increasing e-commerce sector has largely benefited to grow e-payment or digital payment systems. The use of wireless electronic gadgets and communication technology to make the purchase of products and services easier is known as digital payment. Digital payments provide rapid, secure, and simple means to complete financial transactions, which benefits both businesses and customers. Additionally, the increasing development of wireless communications and technology has transformed today's commerce activities in the world. Mobile payment wallets, which allow users to store several payment methods to make mobile payments, therefore act as a digital representation of a real wallet.

In the context of Nepal, the use of digital payment systems has increase remarkably in recent years as evident from the data published by the published by Nepal Rastra Bank (NRB) (2022) no. of transaction in terms of volume using wallets was 1,01,79,557 in FY 2019/20 which has reached to 1,48,84,701 in the FY 2021/22 and the transaction in terms of value using wallets was Rs. 10,222 (Million) in FY 2019/20 which has jumped to Rs. 14,660 (Million) in FY 2021/22. During COVID-19, there is a global trend of steadily rising mobile banking adoption. The major player in the transformation of digital payment are the Payment Service providers (PSP) and Payment Service Operator (PSO).

PSP is the organization that offers beneficiaries payment-related services. It also includes organizations that transfer funds domestically and internationally, carry out electronic payment transactions, or pay for assets, liabilities, or other items on behalf of beneficiaries. whereas the entity that handles payment-related operations, management, and clearing is known as PSO. The organization that manages clearing houses, electronic cards, and other electronic (online) payment networks is also referred to by this term. The PSPs and PSOs are operated after the issuance of license by NRB. The COVID-19 situation has boosted

the adoption of PSP or digital wallets. The significant increase in users suggests that digital payment platforms have room to grow. Despite of huge growth potential, due to lack of proper ICT infrastructure and facility it can lead to another digital divide.

At present there are total of 28 PSPs licensed by NRB till the Fiscal year 2020-21 (Oversight Report NRB, 2020-21). Since, the trend of digital payment is increasing globally, India, our neighbor country, has transformed the entire digital payment system with the introduction of Unified Payment System (UPI) by National Payments Corporation of India (NPCI). A single smartphone application called UPI combines various financial services, easy fund routing, and merchant payments (of any participating bank). Additionally, it supports "Peer-Peer" collect requests that may be paid and scheduled at the user's convenience. UPI is gaining popularity in India and being praised by various countries the NPCI International, in 17 February 2022, has collaborated with Gateway Payments Service Pvt Ltd, authorized Payment System Operators in Nepal (NPCI International, 2022).

However, despite this enthusiasm and rapid development, it has been noted that the Internet is a challenging environment to do real business (Poon and Swatman, 2005). Thus, despite the rise of consumers of Payment Service Provider in Nepal, its effectiveness of service is also a major concern.

1.2 Statement of problem

It is crucial to describe the problem statement because the research begins with the issue that needs to be resolved (Baldwin, 2018). There has recently been a discernible tendency in several nations to move toward electronic payments (e-Payment). The use of ICT in the Payment or finance sector is more boosted because of the impact of COVID-19 due to its vulnerability in the spread of virus. In such situation, developing country like Nepal where the awareness of the digital payment which was just in its initial stage, has grown exponentially.

The rise of PSPs has highly contributed in the economy of the country contributing to reduce inflation rate and unemployment levels, increase foreign direct investment and government revenue, and ultimately raise economic growth and has played a vital role in increasing the digital payment adoption nationwide. Due to the presence of several

competitors and market saturation caused by the majority of them providing comparable services and functionalities, the PSP business is currently overcrowded. Thus, with immense competition in the market among PSPs, it has been very essential to know the determinants and measurement of effectiveness so that PSPs can focus on these elements. Furthermore, there has been extensive research in adoption of digital payment. However, very less research and studies have been done about effectiveness of Payment Service Providers specially in Nepal. Therefore, this study is intended to help in identifying major factors affecting the effectiveness of PSPs and its future prospectus.

1.3 Research Question

The major research question for the proposed study are listed as follows: -

- a) What are the trends and adoption status of PSPs in Nepal?
- c) What are the factors affecting the effectiveness of PSPs among the users in Kathmandu valley?
- d) What are the challenges to PSPs in Nepal with entrance of PSOs with Open Innovation such as UPI and its future prospects?

1.4 Research Objective

1.4.1 Main Objective

The major objective of the study was to identify the effectiveness of Payment Service Providers (PSP) with its future prospects based on the sample collected from the users in Kathmandu Valley and to identify the challenges faced by PSPs.

1.4.2 Specific objectives

- To examine the trends and status of adoption of PSPs in Nepal.
- To analyze factors affecting the effectiveness of PSPs among sample collected from the users in Kathmandu Valley.
- To study the challenges to PSPs in Nepal with entrance of PSOs with Open Innovation such as UPI and its future prospects.

1.5 Significance of the study

The study was aimed to analyze the trends and adoption of PSPs and finding their effectiveness. This study has been undertaken to understand about major determinants that affect the effectiveness of PSP industry in Nepal. This study will focus on finding the

various factors involve to perform a reliable and secure payment digitally with an ease of use to the existing and potential users. The findings of this thesis will help digital payment service providers to understand the factors required to increase its effectiveness and will help the innovators and regulators for drafting future action plans and policies. Hence, the study and findings from this research will be helpful for the PSPs management team to consider the findings for increasing its effectiveness and impact of the variables of PSPs will also be useful to other service industries to make strategies to increase effectiveness.

1.6 Scope and Limitations of study

The digital payment system has a very broad scope that covers electronic payment methods such card use, ATM use, Internet use, mobile phone use, and other devices. This study is based only on analyzing effectiveness of Payment service providers on mobile or digital wallets domain. There are various limitations of the study which are as follows:

- Due to time constraints the sample was taken as per the researchers convenience.
- The study is limited only in Kathmandu Valley due to limited resources, geographical and time constraints.
- Data was collected randomly through convenient sampling method

CHAPTER TWO: LITERATURE REVIEW

The major objective of this chapter was to discover the causal factors affecting the adoption, user behavior and their perception towards digital payment system which were applicable to the study of parameters responsible for the effectiveness of the digital payment systems in Nepal. In order to eliminate information duplication, formulate the study's research questions, and create its theoretical framework, this process was carried out. Journal articles, books, government and business reports, newspapers, theses and dissertations, and online publications are some of the information sources used in the study. Literature review is based on any studies related to digital payment system, its implementation, challenges, adoption and effectiveness.

With the use of digital wallets, users can move money across transaction accounts and make payments online.

2.1 Evolution of Electronic Payment System

In pace with technological development, the usage of technology in payment systems has substantially changed asserts that the Federal Reserve Bank first sent money through telegraph in 1918, marking the beginning of the growth of electronic payments. Electronic money did not, however, become widely used until the Automated Clearing House (ACH) was established by the US Federal Reserve in 1972 Graham (2003). This gave commercial banks and the US Treasury an alternative to processing checks. Following this development, numerous evaluations of the e-payment system have been conducted.

Following the establishment of the bank's strategic plan I (2006–2010), the NRB began systematically modernizing the national payments system in Nepal. This plan was expected to result in the creation of contemporary payment system infrastructures, especially automated clearing house systems. The Payment and Settlement Systems Master Plan to be established. It shall be encouraged to use electronic payment methods like debit and credit cards. In the meantime, Nepal's first digital wallet e-Sewa was established in 2009, a subsidiary of F1Soft International, is a licensed Payment Service Provider by Nepal Rastra Bank. In its Strategic Plan II (2012-2016), the NRB maintained its focus on the development of the payments system. It sought to advance an effective and efficient payment system, create the Electronic Payment and Fund Transfer Act, establish a payment

system unit, implement electronic check clearing, implement RTGS, and establish rules for e-payment, electronic funds transfers, internet banking, and credit card operations. In 2017, the strategic plan III was made public, and it outlines some of the key modernization factors, including the the automated payment system, the use of cutting-edge financial technologies (FinTech), the adoption of robust and modern technologies used for regulatory, and the growth of the infrastructure of financial market. By encouraging effective market infrastructure, it seeks to progressively transition from the conventional cash-dominated payment system to a digital and cashless.

Chronology or timeline of development of digital payment system in Nepal is illustrated below.

Table 2.1: Chronology of development of Digital Payment System

S.N.	Date	Organization/Company	Description
1	1990	Nabil Bank	Introducing card banking to the economy for the first time through the issuance of credit cards
2	2002	Kumari Bank	Internet Banking
3	2004	Laxmi Bank	SMS Banking
4	2009	eSewa	Digital Wallet / Payment Gateway & Service Provider
5	2016	Almost all Banks	Through its network, the Smart Choice Technology (SCT) aims to integrate card banking among banks and other financial institutions.
6	2017	Khalti	Digital Wallet / Payment Gateway & Service Provider
7	2017	IME Pay	Digital Wallet / Payment Gateway & Service Provider
8	2019	Fonepay Payment Service Limited	Nepal's first mobile payment interoperable network

2.1.1 Drivers of Payment Digital

Digitalization is the complex process and it is the outcome of the four drivers and its related factors. There are four drivers that administer a country's digital evolution:

Supply Conditions: It refers to the level of development of the infrastructure to simplify digital interaction and transactions. This establishes the worth of the physical infrastructure required for the development of the digital economy, such as digital payment selection, access to financial and high-quality transportation infrastructure, efficient logistics, and sophisticated communications.

Demand Conditions: It refers to the willingness of the consumers to engage in the digital ecosystem. High demands indicate that there is untapped market potential for the investors. It also includes the level of financial inclusion and usage of electronic form of money, technology, and internet, mobile device, and digital media usage.

Institutional Environment: It refers to the rules and regulation, government policies regarding dispute settlement, investor protections and bureaucracy, acceptance of government and use of digital technology.

Innovation and Change: This driver of digital evolution includes options of getting finances and prospect; ability of a start-up; capability to entice and maintain talent, mobile engagement penetration; scope of invention; social linkage usage and digital recreation

2.2 Digital Payment or Electronic Payment Industry

According to Humphrey, et.al. (2001), cash and related transactions that are carried out electronically are referred to as electronic payments. Usually, this calls for the utilization of digital stored value systems and computer networks like the Internet. The technology enables bills to be paid directly from bank accounts without the account holder being present at the bank and without writing and mailing cheques.

According to Slozko and Pello (2015), "e-payment systems are significant tools utilized by both individuals and businesses as a safe and practical method of sending money online, as well as a doorway to future technical development in the area of global trade".

Bezhovski, (2016), observed that in particular, from person-person transfers, but including government-person transfers, online and off-line sales of services and goods, as well as the payment of fees and bills, can all be encouraged and promoted through mobile payments.

Consequently, mobile wallets and payments are seen as helpful for the (unbanked) upper middle and lower classes.

With the increasing technological advancement in the various sectors across the globe, the financial sector can't stand alone to embrace the use of ICT which has led to the inception of digital payment system and at present this industry is racing to build a robust and more sophisticated system. The rise in the use of digital payment system has received a next level attention amid COVID-19. In the present time it has been a compulsion for the individual to be known about it even the Government sector has started its use. However, there still is a long way ride for the country like Nepal to completely accept due to lack of proper ICT infrastructure which has created another digital divide within the nation. In case of neighboring country India, Sanghita Roy, Dr. Indrajit Sinha (2014) have stated that India's e-payment system has grown significantly, but there is still plenty that can be done to boost utilization. Still, cash is used in 90% of transactions. As per the report published by Nepal Rastra bank (NRB), 2022 number of transactions in terms of volume using wallets was 1,01,79,557 in FY 2019/20 which has reached to 1,48,84,701 in the FY 2021/22. This represented a Compounded Annual Growth Rate (CAGR) of 20.83%. Also, the transaction in terms of value using wallets was Rs. 10,222 (Million) in FY 2019/20 which has jumped to Rs. 14,660 (Million) in FY 2021/22. This represented a CAGR of 19.75%.

2.3 Digital Wallet or Payment Service Providers (PSP)

A digital wallet hides the low-level details of carrying out the payment protocol required to make the payment while still enabling the user to make an electronic payment with a financial instrument (such a credit card or virtual currency). Mobile wallets are used by persons who would prefer not to carry a traditional wallet when making in-store purchases, while digital wallets are primarily utilized for internet transactions. The main distinction between a digital card and a digital wallet is that a digital card allows you to make purchases in excess of what is available in your account. It implies that you can benefit from credit card restrictions. Because you will always need a cell phone and internet access, digital wallets do not allow offline payments.

A digital wallet, also known as an e-wallet or mobile wallet, is a type of cashless payment that makes it simple for users to complete transactions. It consists of a software component

that encrypts and secures personal data as well as the transaction itself. Digital wallets are often kept on the client side, are entirely interoperable, and are simple to maintain. Consumers now use digital wallets, which are simply cellphones that can replicate as leather wallets (Soegoto and Sumantri, 2022). In order to complete a transaction using digital wallets there are plenty of players actively contributing to deliver a secure platforms, user friendly interface and simplified procedure. The digital wallets ecosystem consists of the following actors to complete a transaction:

Payment Service Provider (PSP)

PSP is the organization that offers beneficiaries payment-related services. It also includes organizations that transfer funds domestically and internationally, carry out electronic payment transactions, or pay for assets, liabilities, or other items on behalf of beneficiaries. There are total of 28 PSPs licensed by NRB till the Fiscal year 2020-21 (Oversight Report NRB, 2020-21). Some of the major PSPs are IME Digital Solution Limited, E Sewa Fonepay Pvt. Ltd., CG Pay Nepal Pvt. Ltd., Prabhu Technology Pvt. Ltd., etc.

Payment System Operator (PSO)

The entity that handles payment-related operations, management, and clearing is known as PSO. The organization that manages clearing houses, electronic cards, and other electronic (online) payment networks is also referred to by this term. There are total of 10 PSOs licensed by NRB till Fiscal year 2020-21 (Oversight Report NRB, 2020-21). Some of the PSOs are Fonepay Payment Services Ltd., Union Pay International Company Ltd., Gateway Payment Service Pvt. Ltd., Nepal Clearing House Limited (NCHL), Nepal Electronic Payment System (NePS), etc.

Merchants (vendors):

They are the ones who conduct direct sales of goods and services to customers over the telephone or in person. Since the majority of online retailers are small businesses with thin profit margins, merchants are primarily searching for dependable and affordable digital payment platforms. Their current involvement with any digital payment platform very

much depends on customer demand. At present Fonepay has 250k+ Merchants who are using the Fonepay platform to sell goods and services in Nepal.

Consumers

They are the trade cycle's last consumers, and they wish to use the DPS (Digital Payment System) to cover the cost of the products and services they acquire online. The most significant part in any DPS is the consumer. In reality, they are the ones who most need to be persuaded of the benefits of employing an IPS since without the consumer, business is nothing. One of the issues facing DPS suppliers is this. Despite the fact that the majority of DPS can offer secure internet transactions, a sizable amount of consumers still think that making payments online is risky. Fonepay has been addressing such problem with the introduction of QR Code payment under interoperable network. At present Fonepay has more than 20 Million consumers using their services.

Regulators

Regulators like governmental organizations, polices implementing agencies, the legal system, and regulators of banking are among them. They have different stakes in the growth of DPS. Among these are the effects of DPS on the money supply, the tracking of tax payments, and the defense of consumer rights and the general welfare. Their current conundrum to promote the building of an effective DPS by safeguarding the interest of the public.

Network Providers

These entity offers assistance with ICT backbone, with DPS software, hardware, and communications resources. In Nepal, the major player providing the internet facilities are Telecom operator: NTC, Ncell and Smart Cell and the Internet Service Provider (ISP): WorldLink, Vianet, Subisu, Classictech, etc.

2.4 Adoption of Digital Wallet or Mobile Wallet

With the use of digital wallets, users can transfer money between transaction accounts, either regular banking accounts or electronic money deposit or use various payment methods, which offer a mechanism for making payments online.

Iman (2018) concluded that mobile payment systems have made it possible for individuals to pay the government, and they have also proven useful in emergency preparedness and disaster relief. As the Covid-19 epidemic showed, various governments, including successfully sent money in the form of subsidies to the unbanked populace at the base of the pyramid through other payment solutions or mobile wallets.

According to research conducted by Loen (2021), For financial authorities, governments, and market actors, it is beneficial to learn how users feel about the acceptance of mobile payments. Financial officials can easily study the networks which result from consumers' transactional behavior in their effort to comprehend, monitor, regulate, supervise, and manage retail payment systems. Governments can, for instance, improve their disaster recovery and emergency response efforts, poverty reduction programs, and government-to-person 12 C. León Transfers are used and distributed in Latin American Journal of Central Banking 2 (2021) 100042. Additionally, in order to comprehend the challenges experienced by small businesses in accepting non-cash payment methods, governments and market actors might analyze the rise of person-business mobile payments in a person-person system. To build and regulate new services and products, market actors in the paytech and fintech sector must have a thorough grasp of how payment systems grow. Central banks must also pay close attention to the networks that people utilizing central bank digital currencies (CBDCs) create.

Several models, including acceptance models like the Technology Acceptance Model (TAM), behavioral models like the Motivation Model (which examines motivational purpose), and the Planned Behavior Model (which examines beliefs and behavior for accepting new mode of payment), can be used to study users' perceptions of using digital wallets. The Technology Acceptance Model (TAM), created by F. D. Davis in 1989, is helpful in determining whether or not people prefer electronic payment methods. According to TAM, the level to what a person thinks that a given system could improve his or her ability to perform at work and the degree to which they perceive it to be easy to use will determine whether or not they accept a new technology. The process of social influence (also known as subjective norms), work perceived utility is influenced by relevancy, output quality, and the capacity to demonstrate results. The perceived usefulness

and perceived simplicity of use are combined with experience and voluntariness to generate the purpose of using, which in turn influences the usage habits. Studies conducted on finding digital payment systems adoption in Nepal are listed in the table below in chronological order:

Table 2.2: Studies conducted on finding adoption of digital payment systems in Nepal

S.No.	Author/Researcher	Theory Name	Major Findings
1	Tamang, et al. (2021)	Technology acceptance model (TAM)	The perceived COVID risk, in conjunction with other independent factors like demography and literacy, causes the adoption of digital payment to be accelerated by elements like ease of use and perceived usefulness.
2	Giri and Ghimire (2020)	Technology acceptance model (TAM)	In the user's early adoption stages, it is essential to be informed of digital transaction services. Effective presentations using various media advertising formats, given that these services are still new in Nepal, it is important to spread awareness of them and educate potential customers about the benefits of digital transactions
3	Pokharel (2021)	Theory of Planned	The more favorable attitudes toward mobile banking, the

		Behavior Scale	more likely it is that friends and relatives will use it, and the more capable mobile banking users are, the more likely it is that mobile banking will be adopted.
4	Timilsina (2018)	Extended Technology acceptance model (TAM)	Use and ease variables have a greater impact than Secure and Trust variables. Therefore, the suppliers of payment services should concentrate more on enhancing the usability, accessibility, and user-attractiveness of electronic payment services.

2.5 Legal and Regulatory Provisions

The central bank of Nepal, Nepal Rastra Bank, is responsible for regulating and supervising institutions and activities linked to payments. There are sufficient legal provisions in place that permit NRB to carry out these tasks. The Nepal Rastra Bank Act of 2002 established the NRB as a stand-alone organization with the authority to control, monitor, and manage the country's banking sector. Similar to that, Nepal's payment and settlement systems are governed by and overseen by law according to the Payment and Settlement Act, 2019. The NRB continually issues numerous directives, guidelines, and regulations to the licensed institutions in order to fulfill its obligation to maintain a secure, healthy, and effective payment system while taking into account local conditions and global best practices. According to the current legal framework, directives, Payment Systems Oversight Framework, and important international guiding policies like Principles of Financial Market Infrastructures (PFMIs) and other common guiding documents, the Payment Systems Department regulates and supervises/oversees the payment-related institutions.

2.5.1 Nepal Rastra Bank Act, 2002

The creation of a safe, sound, and effective payment system is one of Nepal Rastra Bank's goals, according to the Nepal Rastra Bank Act, 2002. Additionally, this law grants authority to oversee, inspect, and control payment, clearing, and settlement arrangements.

2.5.2 Payment and Settlement Act, 2019

One of the most significant pieces of legislation is the Payment and Settlement Act, 2019. The following are the Act's main elements:

- **National Payment Board:** Act has made the provision of National Payment Board. The board's primary responsibilities are to maintain the stability of the financial sector by ensuring that payment systems are secure, capable, and managed, to reduce any inherent risks in the payment system, to increase public confidence in the payment system, and to create policy provisions regarding the modernization of payment systems. The Payment Systems Department will serve as the Board's secretariat.
- **Licensing responsibility:** The NRB is in charge of deciding whether to grant, revoke, or deny a license to an organization to operate a payment system or as a payment service provider.
- **Oversight and Inspection:** The NRB has the authority to regularly monitor and examine the licensed institutions.
- **Dispute Settlement Committee:** The Dispute Resolution Committee will deal with any disputes that might arise between the institutions about any work done in accordance with this Act.
- **Power to give direction:** NRB has the authority to instruct licensed institutions on how to carry out the law.
- **Power to frame by law:** The Act gives NRB the authority to draft bylaws to carry out the Act.
- **RTGS:** High value and crucial payments must be made through the RTGS gross or net system, as directed by the bank, as well as transaction settlement.

- **Punishment, Fines and Penalties:** The Act provides provisions for punishment, fines, and penalties in the event that any of its or a bylaw's rules are broken or not followed.

2.5.3 Licensing Policy for Payment Related Institutions, 2016

All BFIs, PSPs, and PSOs are included in the licensing policy's purview. This policy specifies the primary prerequisites for obtaining the license as well as the guidelines and operational standards. This policy is currently being revised.

2.5.4 Nepal QR Standardization Framework and Guidelines

Consumers and businesses alike are starting to favor QR as a payment method. Wallets have a major influence on consumer behavior when it comes to scanning QR codes for payments and are largely responsible for popularizing mobile payments globally. In Nepal too, many licensed PSOs have embarked this journey and popularised this payment trend. Whilst this market/ industry led trend of QR payments has its advantages, there have been undesirable impacts leading to inequitable situations too. Most of these QR providers are closed loop i.e., QR codes developed and deployed by these providers can be scanned and paid by using their consumer apps only, therefore non-interoperable. So, if a customer wants to use a phone to pay at multiple retailers – acquired by multiple providers– he or she would need to download and manage separate apps –Overhead and an inconvenience to consumer.

An imbalance is becoming more and more likely as the payments ecosystem develops and the number of operators and providers of payment systems multiplies. As a result, standards must be created in order to promote uniformity and give every player in the payment industry an equal chance to succeed. Interoperability, Scalability, and Security are the three main payment principles covered by this standard. It is therefore suggested to create a framework for the installation and use of QR codes and to have mandated Standards for them.

The QR code Standardization Framework and Guidelines includes the following:

- Eligibility for Scheme/Network
- Eligibility for Acquiring and Issuing.

- Major Responsibilities of Scheme/Network
- Major Responsibilities of Acquirer
- Major Responsibilities of Issuer
- Fees and Charges
- Settlement Mechanism
- Risk and Compliance
- Customer Service, Grievance Handling and Dispute Management
- Information Security Program
- Customer Education and Awareness
- QR Logo & Branding
- Interoperability compliance

2.6 UPI as Open Innovation in the Digital Payment System

After Demonetization in India in 2016, there was a significant demand for note currency, but there was inability of the government to meet that need because it also wanted to encourage cashless transactions. A test launch by NPCI involved 21 member banks. Dr. Raghuram G. Rajan, Governor of the RBI, launched the as the pilot program on April 11, 2016, in Mumbai. Beginning on August 25, 2016, banks have begun to submit their UPI-powered applications to the Google Play store. The Reserve Bank of India oversees the Unified Payments Interface (UPI), a payment system that allows for fast fund transfers between two bank accounts on mobile devices. It was developed by the National Payments Corporation of India. To transfer money using a Virtual Payment Address (a special ID issued by the bank), an Account Number with an IFS Code, a Mobile Number with an MMID (Mobile Money Identifier), an Aadhaar Number, or a one-time use Virtual ID, UPI is built on IMPS. Each payment must be confirmed using an MPIN (Personal Identification Number for Mobile Banking).

UPI came into action with the objectives as follows:

- Enabling instant payments through apps for mobile, web, and other platforms.

- providing both sender and receiver channels with a more secure, convenient payment solution.
- In order to make electronic payments convenient and secure, it enables banks and other participants to innovate and provide a greater consumer experience.
- Supports the growth of e-commerce, while simultaneously meeting the target of financial inclusion.
- Some of the key features are virtual payment addresses, one-click two-factor verification, Aadhaar connection, and usage of the payer's smartphone for secure credential capture.

Some characteristics of UPI include

- Account information for the payor and payee for authorization
- Authentication information
- Transaction's value
- Transaction identifier
- Time frame
- Additional information, if necessary, including location, product code, cell number, device information, etc.

The Unified Payments Interface (UPI) is a revolutionary, user-friendly, real time payment solution that facilitates inter-bank transactions, and enables greater digital payments adoption in the country. Developed and launched by the National Payments Corporation of India in 2016, UPI is now one of the most preferred payment solutions in India, with over a billion transactions every month. UPI's core function is to support easy and secure money transfers between bank accounts. It does this by adding multiple bank accounts into a single mobile application, allowing for seamless fund transfers and merchant payments from one place. It also enables 'peer to peer' and 'peer to merchant' collection requests, which can be scheduled and paid as requested.

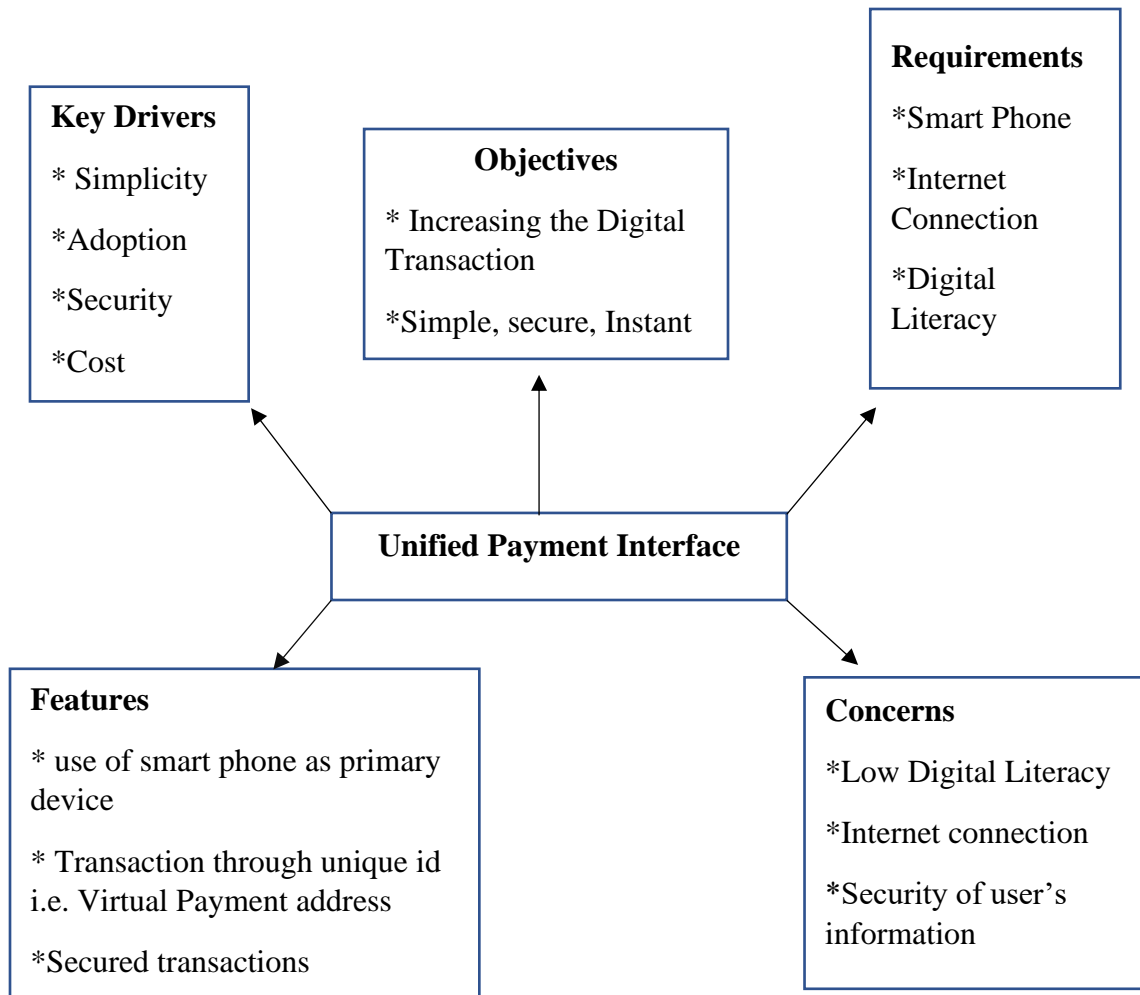


Figure 2.1: Conceptual Structure of Unified Payments Interface (Kakadel et al., 2017)

India invented the UPI (Unified Payment Interface), a digital breakthrough with a quick payment option. UPI utilizes a technology called Open API (Application Programming Interface).

2.7 Major Differences between UPI and Digital Wallets

In order to understand the difference between the UPI and Digital wallets first we need to dig down the revenue model of Digital wallets or e-wallets. Basically, the revenue model e-wallets are:

- Digital wallets generate revenue from the merchant's payments or for any utility payments embedded in the wallet known as Merchant Discount Rate (MDR). For

example, if you book a flight from e-wallet some percentage of commission is also associated with the total price of the flight in wallets.

- E-wallets charge some extra amount while loading money into the bank account from where they generate good amount of revenue
- E-wallets earn from the Ads displayed in their application
- Another source of revenue for e-wallets are the interest on the customer's amount maintained in wallets

UPI is a feature of interoperability between different banks that allows transfers and payments to be done straight to the appropriate bank accounts rather than building up in e-wallets. Customers are more satisfied and trust UPI than e-wallets because the payment is made directly into the bank account. E-wallets lack this capability of sharing funds among themselves, and the transfer of funds from an e-wallet balance to a bank account is subject to a number of terms and limitations. For instance, neither the eSewa e-wallet balance nor the cashback accumulated in bank accounts can be transferred to an e-wallet of IME Pay.

Minimum wallet balance requirements and the marketing ploy of cash backs are both subject to restrictions and cannot be freely transferred or used. You no need to carry any amount in your wallet the money is directly transferred from sender's bank account to receiver's bank account. In UPI a unique Virtual Payment Address (VPA) is generated so there no need to send any personal bank details to sender for making any transaction. Thus, UPI is simpler, faster, secure and interoperable payment ecosystem.

2.8 Tae Hwan. Shon & Paula M.C. Swatman's Criteria for Effectiveness Criteria of Internet Payment Systems

This study is based on model created by Shon & Swatman. "Any traditional or modern payment system that enables safe financial transactions to be carried out between parties on the Internet, whether they be businesses or individuals." Shon & Swatman, (1998). Their model is based on 6 major parties directly involved with Internet Payment System: Financial Institutions including Banks and Non-Bank Financial Institutions (NBFI), Internet Payment Providers (IPS) or manufacturers, Merchants (vendors), Consumers, Regulators and Network Providers.

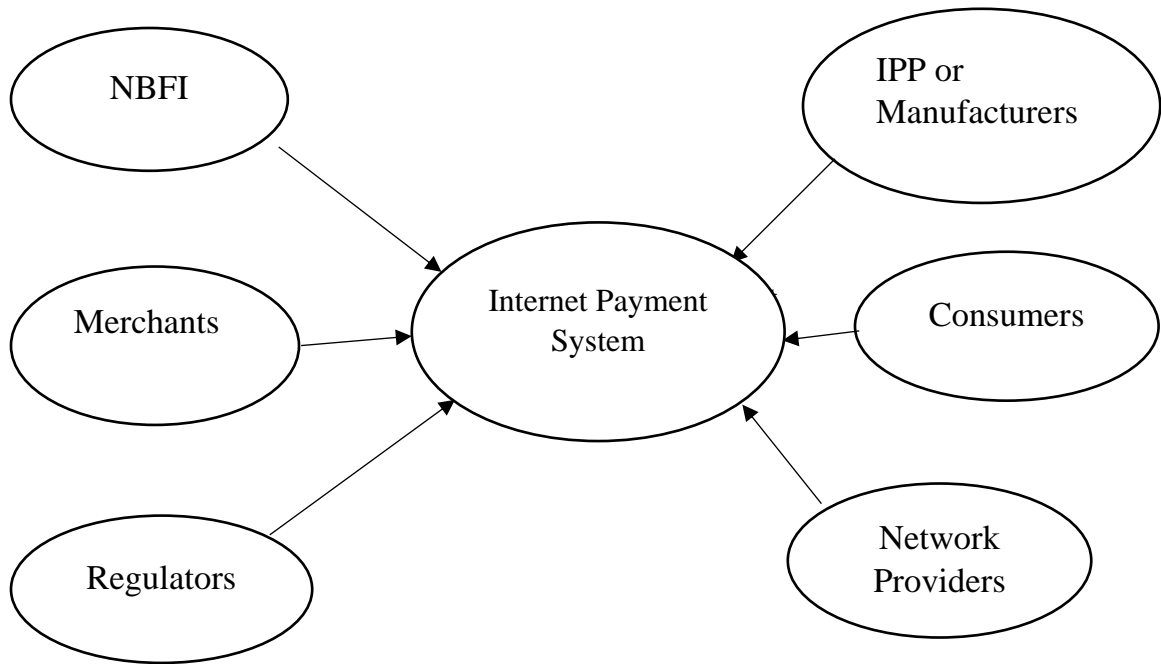


Figure 2.2: Six major parties in Internet Payment System (Shon and Swatman, 1998)

These six major parties play an important role in adding value to the firm which are explained as follows:

- Internet Payment Service (IPS) providers or manufacturers are the parties that operate and manage the Internet Payment Service (IPS) and they might range from small businesses to major corporations. Typically, they are in charge of giving retailers and customers the IPS software and interfaces they need.
- Merchants are the parties who sell products and services to customers directly via the Internet while utilizing an IPS.
- The legal profession, government agencies, law enforcement, and banking regulators are examples of national regulators. They all have different stakes in the growth of IPS.
- The parties that supply network infrastructure, such as IPS software, hardware, and telecommunications facilities, are known as network providers..

Shon and Swatman have suggested various effectiveness indicators based upon the roles of six major parties mentioned above.

Table 2.3: IPS Effectiveness Indicator Ranking (Shon and Swatman, 1998)

S.No.	Effectiveness Indicators	F	P	M	C	R	N
1	Acceptability		3				
2	Anonymity				5		
3	Authentication	4					
4	Duration of transaction process			5			
5	Ease of use (convenience)		5		6		
6	Flexibility			4			
7	Low transaction cost	3		1	1		
8	Privacy				3		
9	Profitability (cost-effectiveness)	4					
10	Regulatory framework					2	
11	Reliability (trustworthiness)	2	2	2	4	1	1
12	Scalability		3				2
13	Security	1	1	2	1		2
14	Traceability					1	
15	Universality						4

Note : **F: Financial Institutions**
M: Merchants (vendors)
R: Regulators

P: IPS providers and manufacturers
C: Consumers
N: Network provider

2.9 Operational Definitions

An operational definition defines the concept and terms of observation and measurable characteristics or behavior by specifying other concepts that can be observed in actual practice.

2.9.1 Effectiveness of PSPs

Payment service providers, usually referred to as merchant service providers or PSPs, are independent contractors who assist businesses in accepting payments. Simply put, payment service providers connect merchants to the larger financial infrastructure, enabling them to

take credit and debit card payments (as well as Direct Debit, bank transfer, real-time bank transfer, etc.).

According to the study conducted by Shon & Swatman (1998), for finding the effective of Internet payment system they have identified the effectiveness criteria based upon the role of financial institutions, Merchants, Regulators, PSPs, Consumers and Network providers. The survey indicated that while regulatory organizations want to be able to track transactions to avoid unlawful use, users are more concerned about security and privacy. While Internet payment service providers and the ones who provides network are more focused with continuity, merchants wanted to offer systems that consumers would want to use.

Dr. R K Uppal (2009) found that cost effective, time savings, time saving, accurate information, effective services, and security are the major concerns for adoption of Digital payment systems by consumer.

2.9.2 Security Concern

Alhassan, et al. (2018) examine the risk management aspects, security precautions, and dangers related to mobile wallet applications using the case study of Pagatech Nigeria Limited. According to the report, mobile wallet providers must offer high level security measures, offer guidance, and periodically raise knowledge so that users won't be concerned about weaknesses and threads being attacked by hackers.

G. N. Reddy and G. J. Reddy (2014) investigated the difficulties with cyber security. Although the researcher's research has not produced a method to curb cybercrime, it does recommend reducing these crimes by implementing numerous security measures.

According to Singh and Kalra (2021), security concerns are one of the crucial and obvious elements that influence how consumers feel about using mobile wallet services. Therefore, in order to attract non-users as well, mobile wallet companies need to push some instructional and promotional initiatives. Additionally, the study found that security aspects have a favorable correlation with consumers' attitudes toward using mobile wallets and influence their attitudes toward using mobile wallet applications.

2.9.3 Interoperability

A product or system's ability to function with other products or systems is known as interoperability. Initially, the phrase was used to refer to services in information technology or systems engineering.

According to the Report published by The Consultative Group to Assist the Poor (CGAP) in 2012, a robust environment of interoperability in payments systems ease all parties in the payments ecosystem, according to Interoperability in Electronic Payments: Lessons and Opportunities. It is simpler for end users to make and receive payments, including customers, businesses, governments, and other types of corporations.”

Interoperability features ends the burden of downloading various apps for different wallets in mobile which saves the memory of mobile phone as well as time of the consumer.

2.9.4 Customer Service

The group of employees responsible for helping clients who are having issues with a business's goods or services is known as customer support. Quality of the Customer service directly influences satisfaction, and contentment directly affects the purpose for good behavior and overall effectiveness, according to Bastos and Gallego's (2008) research.

Satisfaction and Loyalty are not surrogating for one another. When there are limited options, for example, a user can be highly satisfied just because of the loyalty, and a customer may be extremely satisfied but not loyal (Shankar and Amy, 2002).

2.9.4 Low Transaction Fee & MDR

Transaction fee refers to amount that is charged by the payment service provider to transfer any amount to the receiver whereas MDR is a fee paid by merchants to Service providers for processing payments which is calculated as a percentage of the transaction.

Faber, et al. (2003) came to the conclusion that consumers do not view payment as a service but rather as "a necessary evil." Therefore, rather than being order winners, low transaction fees, ease of use, and assured delivery are "dissatisfiers." This means that it's critical for mobile payment providers to market payments as an enabler of new value-adding services rather than as a standalone product.

2.9.5 Regulatory Constraints

Shon and Swatman, (1998) studied on effectiveness criteria for Internet payment system which suggested Regulatory framework, reliability and traceability are the major criteria

for identifying the effectiveness of Internet payment system. Controlling the flow of money is the responsibility of the regulatory organizations. In order to manage customs duties and taxes, they must gather data on transactions. To improve the efficiency of Payment service providers, regulators should take a facilitative rather than a controlling role. They are faced with the challenge of protecting the public interest while promoting the growth of effective Payment Service Providers.

2.9.6 Cross-border P2P & P2M Transaction

Real time cross-border transaction refers to transfer of money digitally from PSPs of one country to PSPs of another country. According to the press release by Gateway payment Services, payment service provider licensed under Nepal Rastra bank, dated 2078/11/05 BS and information released by NPCI International on 17 February 2022, have announced that they are introducing UPI Nepal with Cross-border transaction facility. It means Nepalese can transfer money from Nepalese PSPs to Indian PSPs and vice-versa.

In India, P2P and P2M transactions can be completed with ease, safety, and security thanks to UPI's real-time payments (RTP) infrastructure.

2.10 Research Framework

The conceptual framework is an analytical method with many variations and meanings. The conceptual framework describes what the study wants to discover. It defines variables important to the analysis and acts as a map that will direct towards the goal or objectives of the research. It is a theoretical structure of concepts, assumptions and laws that keeps the ideas of a broad concept together. It is used to make logical distinctions and to organize ideas. Based on the research's purpose and literature reviews, the conceptual framework is structured to summarize the key emphasis and scope of variables used.

The study aims at analyzing the customer-based effectiveness of PSP industry in context of Nepal and study the challenges to PSPs in Nepal with entrance of PSOs with Open Innovation such as UPI and its future prospects. The Study is based on effectiveness indicators model (Shon and Swatman's, 1998).

Dependent variable of the study is Effectiveness of PSPs and independent variables are Security Concern, Interoperability, Customer Service, Low Transaction Fee & MDR, Regulatory Constraints and Cross-border P2P & P2M Transactions which are the

components of forming effectiveness of PSPs. The study's goal was to find out the association between the effectiveness and dimensions of effectiveness.

Framework of this research is shown in below figure:

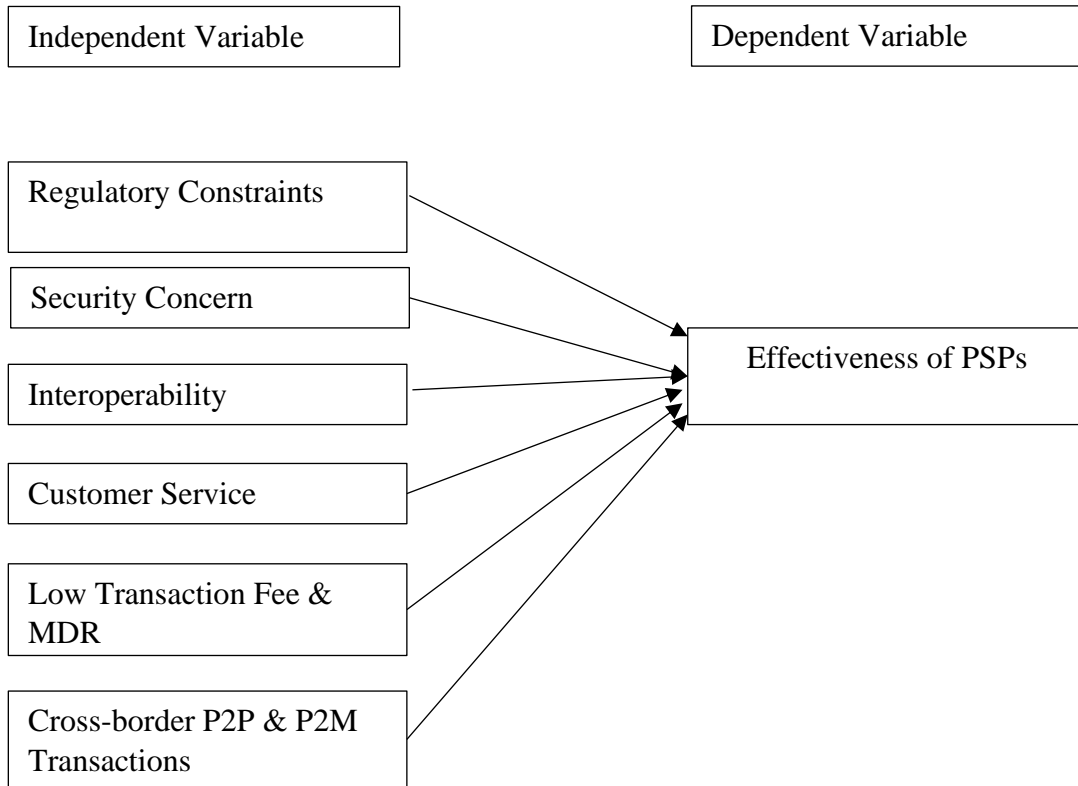


Figure 2.3: Research framework

CHAPTER THREE: METHODOLOGY

The research challenge can be addressed methodically using research methodology. It offers the fundamental framework on which the study is built. It aids in determining the accuracy, validity, and applicability of research and provides the rationale for the use of a particular method or approach. This chapter outlines the research design, research procedures, sample strategies, and the device used to collect data. Research methodology outlines the general plan for the study. It offers the fundamental framework on which the study is built. It is a means of methodically resolving the research issue. The approach and procedure used during the entire investigation are described in this chapter. This chapter goes into great detail describing the research design, data gathering process, and data analysis process. This chapter sheds light on the research methodology used to complete the goal of the study.

3.1 Research Framework

Research framework will be for implementing the steps taken throughout the research. It is normally used as a guide for researchers so that they are more focused in the scope of their studies. Whether you are working to solve a unique organizational issue or making a contribution to theory, the research design framework will help you align the “DNA” of your study to deliver the insights that you need. The research framework is organized various components with clear linkages. This empirical study investigates customer’s perceptions towards digital wallets and comparison of the services provided by digital wallets with the services offered by UPI and the potential threat it may cause to the existing digital wallets industry. The research design in this study is a causal comparative one. This design has been adopted to establish relationship between consumer’s usage behavior on existing PSPs and their prospects to accept advanced features offered by UPI over PSPs. This study further investigates on the challenges faced by PSPs on their business due to introduction of UPI in Nepal and explore the way forward for PSPs. The Steps for the research framework may vary depending upon the type of research. For this study the following steps of research process were adopted and performed which is presented in Figure 3.1.

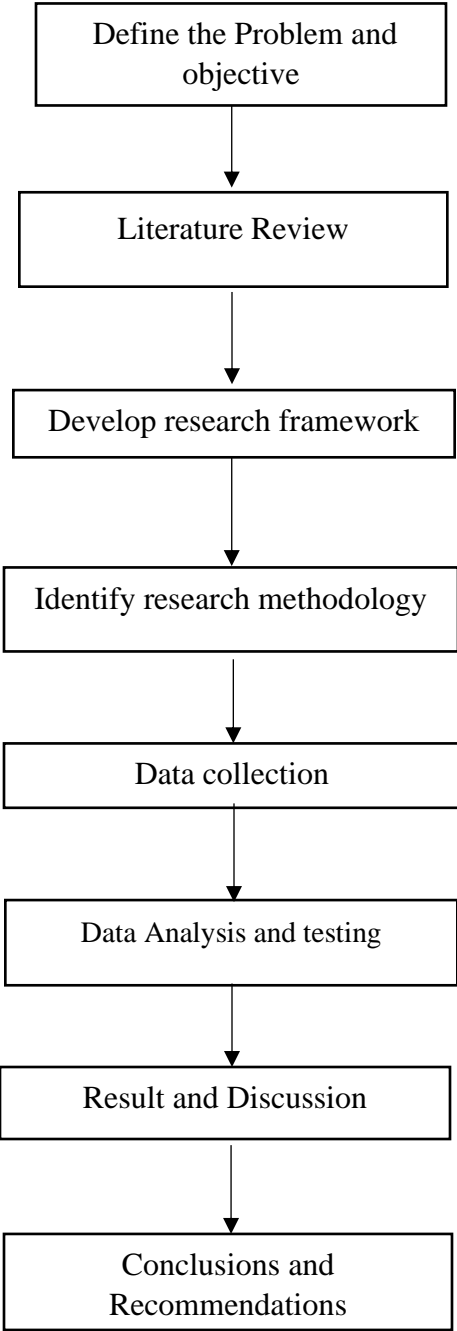


Figure 3.1: Methodological Framework

The following conceptual framework is established to summarize the major focus and scope in terms of variables covered, based on the study's objectives and the literature research. To confirm or refute the hypotheses relating to the created relationships between the variables in the conceptual model, hypotheses on each variable were developed, and data were analyzed. The conceptual model is illustrated in Figure below:

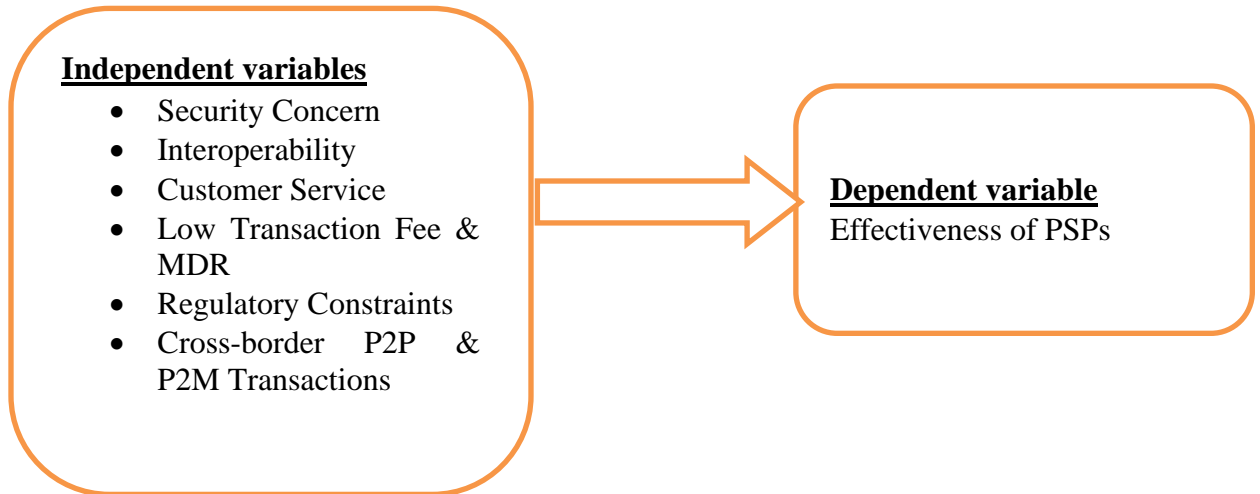


Figure 3.2: Conceptual model

3.2 Hypothesis Development

The following alternate hypothesis has been formulated to measure significant relationship

between effectiveness indicators and effectiveness of PSPs:

H₁: Security Concern has a positive and significant effect on effectiveness of PSPs.

H₂: Interoperability has a positive and significant effect on effectiveness of PSPs.

H₃: Customer Service has a positive and significant effect on effectiveness of PSPs.

H₄: Low Transaction Fee & MDR has positive and significant effect on effectiveness of PSPs.

H₅: Regulatory Constraints has positive and significant effect on effectiveness of PSPs.

H₆: Cross-border P2P & P2M Transactions has a positive and significant effect on effectiveness of PSPs.

3.3 Research Design

The set of techniques and procedures used to gather and assess measurements of the variables specified in the problem investigation is known as the research design. “A researcher or scientist uses research design, a systematic, planned technique, to carry out a scientific investigation. It is a thorough coexistence of already identified components and any additional knowledge or data that results in a logical conclusion.” (Saeed, n.d.). This study is based on quantitative approach of research in which relationships of various

hypothesis are tested using the different statistical methods. Six different hypotheses have been developed and testified as pilot project based on the data obtained from survey.

The study's objective was to be descriptive in nature. Descriptive study aims to systematically define a population's, condition's, or phenomenon's characteristics. It is a research method that focuses on “what” rather than “why” of the research subject (Mc. Combes, 2020). The study is also based on correlational design of research which describes the relationships that exists among the variables. The correlational values among the variables could be positive or negative. Positive correlational values show that variables are directly proportional to each other and negative correlational shows that variables are inversely proportional to each other.

3.4 Study Site

The study has been conducted in three districts of Kathmandu valley, Nepal; Kathmandu, Lalitpur and Bhaktapur.

3.5 Study Population

The target population of the study are the consumers who are currently using PSPs for sending and receiving payment from Kathmandu valley.

3.6 Sampling Technique

Purposive non-random sampling was used in the study. A family of sampling procedures known as "purposeful sampling," often referred to as "judgmental" or "subjective sampling," relies on the researcher's judgment when deciding which units to include in the study (such as individuals, cases or organizations, events, or data points). When participants were available and willing to participate in the study, a purposeful sampling strategy was adopted. It concentrated on specific population characteristics that were of interest and would best enable researchers to answer the research question (Al-Emran and Salloum, 2017). When a sample is produced by non-random method, it is said as non-probability sampling.

3.7 Sample Size

A population's approximate sampling size is 1,000,000. It is calculated as follows for sample:

$$s = X^2 NP(1-P) / (d^2 (N-1) + X^2 P(1-P)) \text{ (Krejcie and Morgan, 1970)} \text{-----Eqn(1)}$$

s = required sample size

X^2 = the table value of chi-square for 1 degree of freedom at the confidence level of 95%
i.e. 3.841

N = the population

P = the population proportion (assumed to be 0.50 since this would provide the maximum sample size).

d = the degree of accuracy expressed as a proportion (0.05)

$$s = 3.841 * 1000000 * 0.5 * (1-0.5) / (0.05^2 (1000000 - 1) + 3.841 * 0.5 (1-0.5))$$

$$s = 383.952$$

$$s \approx 384$$

Out of selected 431 circulated questionnaire, 405 responses were obtained that had completely filled valid responses. So, in this case, the sample size is 405. Since, the selected sample was 384 but, as it is the least number accepted (Krejcie and Morgan, 1970). Hence, sample size 405 is regarded as a suitable sample size.

3.8 Instrumentation

The primary sources of data are consulted in the quantitative research. The effectiveness of PSP was assessed using a self-administered questionnaire from the survey.

The structural questionnaire is created to gather information about numerous aspects that affect PSP effectiveness. The first section of questionnaires asked about demographic details including gender, age, level of education, income, etc. This section of the questionnaire was used to analyze the respondents in a descriptive manner. In a similar vein, the second section of the questionnaire was created to examine the several PSP effectiveness metrics. There was lots of statement that characterizes every factor that influence effectiveness of PSPs. All statements were evaluated using a Likert scale (5-point scale). was used for the survey of which 1 is strongly disagree, 2 is disagree, 3 is neutral,

4 is agree, 5 is strongly agree. The degree to which each assertion was agreed or disagreed with was used to gauge how respondents felt about each statement.

The part II includes different statements of the Security Concern, Interoperability, Customer Service, Low Transaction Fee & MDR, Regulatory Constraints and Cross-border P2P & P2M Transactions on effectiveness of PSPs. Cronbach's alpha has been used to evaluate the data's dependability.

To collect the data, survey was conducted by distributing a structured questionnaire to different consumers segment which includes respondents from limited geography and demography. The primary sources were used to extract the information from the consumers and merchants.

Primary data are the foundation of the investigation. SPSS is used to study the data from the survey questionnaire. Inferential statistics and descriptive statistics are the tools. Cronbach's alpha is utilized to evaluate the data's validity and dependability. The factors that determine the efficacy of PSPs are measured in this study using frequencies, percent, means, correlations, and tests of significance. A structured questionnaire was created to accomplish the study's goals. The thoughts brought up in the review of literature were used to create the questionnaire. There are four sections to the questionnaire. Basic demographic data on the respondents is included in the first "Section A" of the report. Consumer usage of PSPs is the subject of "Section B" multiple-choice questions, and "Section C & D" Likert-type questions about the effectiveness of PSPs based on consumer perception are the subject of "Section C & D". The scales for these questions are 1 is strongly disagree, 2 is disagree, 3 is neutral, 4 is agree, and 5 is strongly agree.

3.9 Reliability and Validity

“The degree to which a concept is precisely quantified in a quantitative investigation is known as validity” (Heale and Twycross, 2015). Validity is the ability of a test or piece of research to accurately measure what it is intended to measure. “A measure's reliability is its constancy.” (Heale and Twycross, 2015) It is the extent to which results can be reproduced while performing the research under same conditions.

Cronbach alpha, one of the most commonly used tests, was adopted in this research to determine the internal logic of a study to test reliability. The study will be more reliable when the Cronbach's alpha values will be higher. Reliability score that ranges from 0.7 and higher is considered as acceptable. (Heale and Twycross, 2015).

In this study, variables security concern, interoperability, customer service, Low Transaction Fee & Merchant Discount Rate (MDR), regulatory constraints and Cross-border Peer to Peer & Peer to Merchant Transactions are used in order to analyze the effectiveness of PSPs and its future prospects. Correlation among these variables were calculated and shown in the Table 3.1.

Table 3.1: Result of Reliability Analysis

The Cronbach's alpha is 0.893 for 25 items which shows the reliability of the study to proceed further. Cronbach's Alpha for each variable

Variables	Item	Cronbach's Alpha
Security Concern	SC1	0.707
	SC2	
	SC3	
Interoperability	IO1	0.729
	IO2	
	IO3	
	IO4	
Customer Service	CS1	0.705
	CS2	
	CS3	
Low Transaction Fee and MDR	LTFM1	0.701
	LTFM2	
	LTFM3	
Regulatory Constraints	RC1	0.715
	RC2	
	RC3	

Cross-border Peer to Peer & Peer to Merchant Transactions	CPMT1	0.752
	CPMT2	
	CPMT3	
	CPMT4	
Effectiveness of PSPs	EP1	0.834
	EP2	
	EP3	
	EP4	
	EP5	
	EP6	

According to (Heale and Twycross, 2015), A Cronbach alpha of over 0.7 is considered credible. As a result, the information used in the study was trustworthy and consistent.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

Analysis of the data is the process of studying and looking at the data that has been gathered for interpretation in order to find facts and information and make judgments. This chapter contains the outcome obtained from the analysis of data. Data presented, analyzed, interpreted in this section has been collected from 435 respondents through questionnaires and out of 435 data only 405 were valid. The result has been obtained on the basis of the statistical tools which has been described in the previous chapter. Results are presented in the form of figures, pie-charts, bar graphs, frequency charts, percentage analysis and cross tabulation. SPSS and MS Excel software was used for data analysis process.

4.1 Demographic Profile of Respondents

The demographic profile includes age, gender, district, education, occupation and income of the respondents. Since, this study deals with the consumers of Payment System Provider (PSP), the respondents of questionnaires are people from different age group, gender, profession, income and education level.

Table 4.1 represents the gender of the respondents. Out of 405 respondents, 283 (69.9%) were male 122 (30.1%) were female.

Most of respondent 175 (43.2%) were under 25, 200 (49.4%) were between 26-30, 24 (5.9%) were between 31-35, 6 (1.5%) were between 36-40. According to the analysis majority of respondents were of age between 26-30 which indicates that youngsters from 26 to 30 age group are the major decision makers. 226 (55.8%) of respondents were from Kathmandu district, 123 (30.37%) of respondents were from Lalitpur district and 56 (13.83%) of respondents were from Bhaktapur district., 221 (54.6%) were having bachelor's degree, 95 (23.5%) were having master's degree and below 84 (20.7) were intermediate and below and 5 (1.2%) were having M. Phill/Ph. D degree. Most of the respondent 258 (63.7%) were job holder, 112 (27.7%) were student, 35 (8.6%) were self-employer.

201 (49.6%) were earning monthly income of Rs. 20000 and below, 100 (24.7%) were earning monthly Rs. 21000-40000, 38 (9.4%) were earning monthly income of Rs.41000-Rs.60000, 34 (8.4%) were earning monthly income of Rs.61000-Rs.80000 income level and 32 (7.9%) were earning monthly income of above Rs.80000.

Table 4.1: Demographic characteristics of respondents

Characteristics	Answer	Frequency	Percent (%)
Gender	Male	283	69.9
	Female	122	30.1
	Total	405	100
Age	Under 25	175	43.2
	26-30	200	49.4
	31-35	24	5.9
	36-40	6	1.5
	Total	405	100
District	Kathmandu	226	55.80
	Lalitpur	123	30.37
	Bhaktapur	56	13.83
	Total	405	100
Education	Intermediate and Below	84	20.7
	Bachelor Degree	221	54.6
	Master Degree	95	23.5
	M. Phil/ Ph. D Degree	5	1.2
	Total	405	100
Occupation	Self-employer	35	8.6
	Student	112	27.7
	Job-Holder	258	63.7
	Total	405	100
Income	Rs. 20000 & below	201	49.6
	Rs. 21000-Rs. 40000	100	24.7
	Rs. 41000-60000	38	9.4
	Rs. 61000-80000	34	8.4
	Above 80000	32	7.9
	Total	405	100

4.2 Descriptive Analysis

4.2.1 Usage Duration

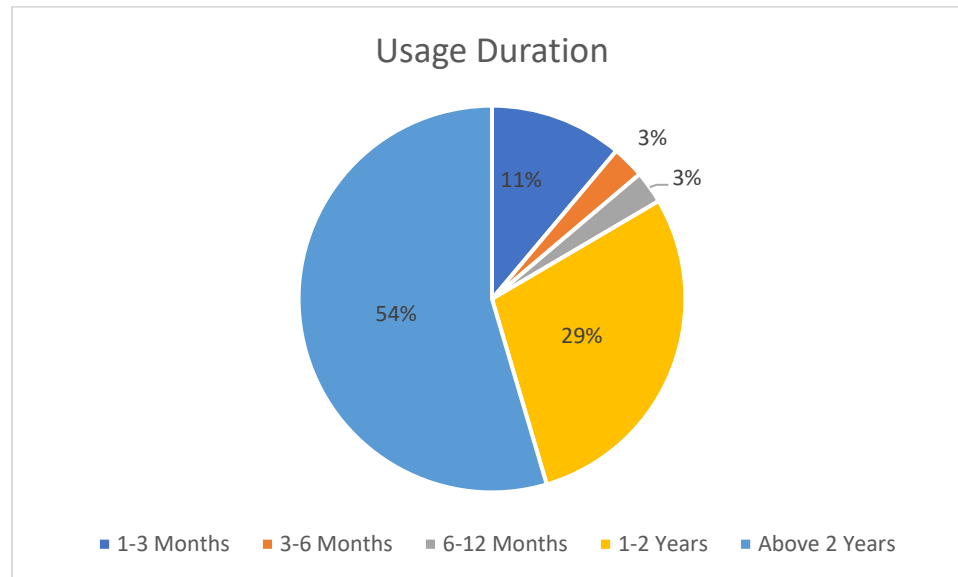


Figure 4.1: Usage duration of PSPs

Figure 4.1 shows the respondents' distribution with respect to usage duration, most of respondent 221 (54%) were using digital wallets for more than 2 years, 117 (29%) were using 1-2 years, 11 (3%) were using 6-12 months, 11 (3%) were using 1-3 months. According to the analysis majority of respondents were using digital wallets for more than 2 years indicates that adoption of PSPs is increasing.

4.2.2 Reason for Use

Data security and convenience are two different reasons to use digital wallets online. Consumers that utilize digital wallets do so instead of directly inputting their credit card information into websites.

Figure 4.2 shows respondents' distribution with respect to reason for use of PSPs, it was observed that majority 145 (36%) of the participants use PSPs for hotel/restaurant's bills followed by 119 (29%) use for other purpose, 79 (20%) use for buying grocery items, 48(12%) use for buying cloths and 14 (3%) use for paying transportation bills.

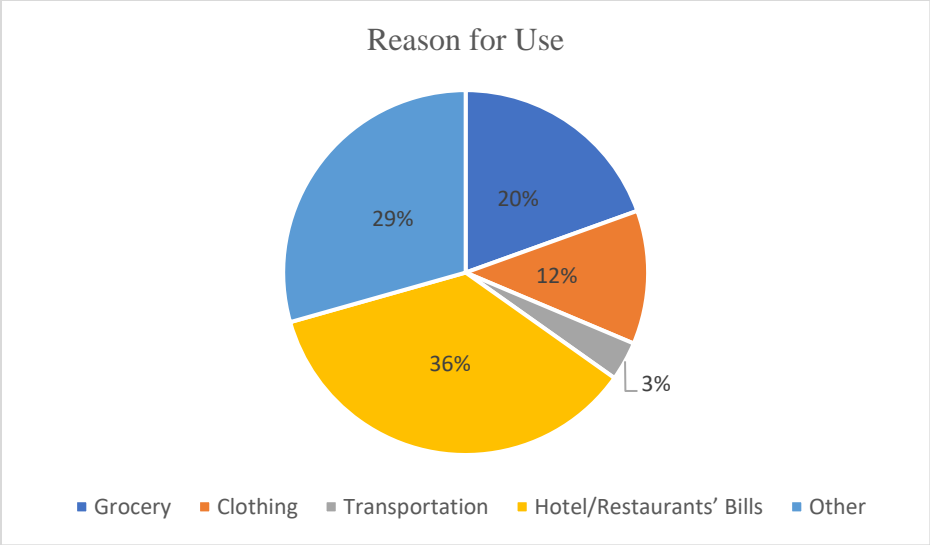


Figure 4.2: Reason for Use of PSPs

4.2.3 Currently Using PSP

There are total of 28 PSPs, licensed by NRB, in this study only 4 are taken on the basis of market share and popularity along with their download volume in playstore. Figure 4.3 shows the participant’s distribution with respect to currently using PSP, most of the respondents 247 (61%) were currently using e-Sewa, 64 (16%) were using other, 52 (13%) were using Khalti, 42 (10%) were using IME-Pay.

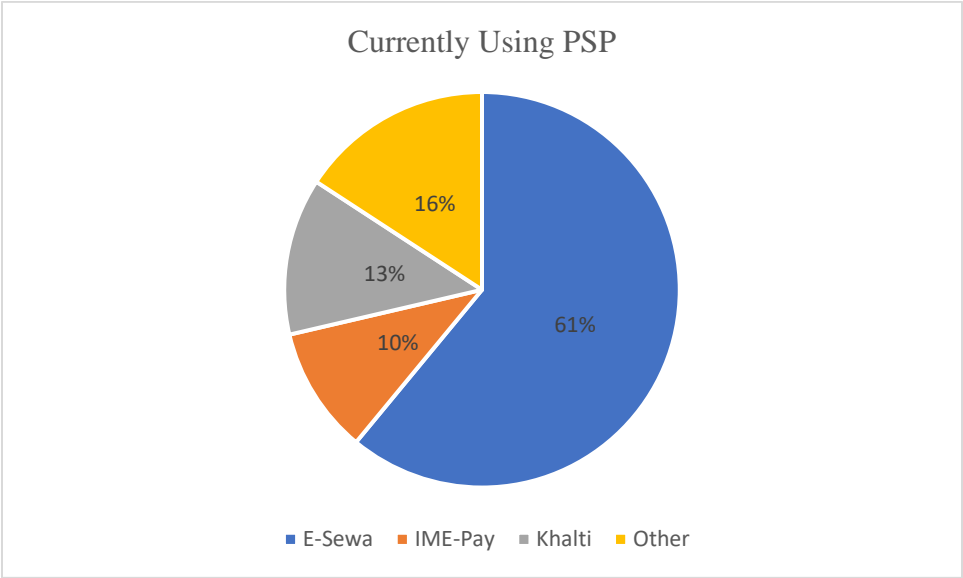


Figure 4.3: Currently using PSP

4.2.4 Frequency of Use

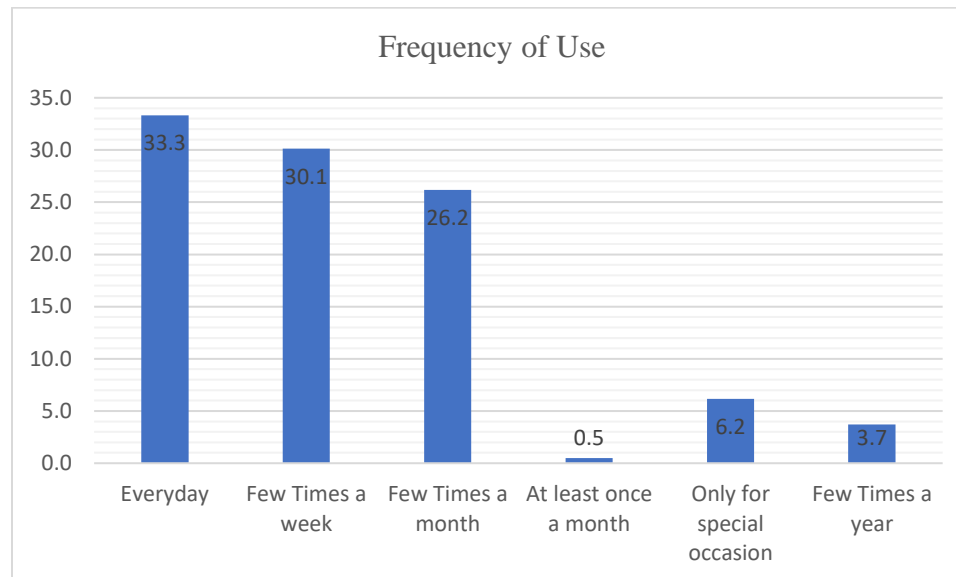


Figure 4.4: Frequency of Use

Figure 4.3 shows the participants' distribution with respect to frequency of use, most of the respondent's 135(33.3%) were using digital payment every day followed by 122 (30.1%) few times a week, 106 (26.2%) few times a month, 25 (6.2%) only for special occasion, 15 (3.7%) few times a year and 2 (0.5%) at least once a month.

4.3 Rising trends and status of adoption of PSPs in Nepal

The digital revolution has increased access to and use of financial services globally, changing how people send and receive payments, borrow money, and save money. The use of digital payments has expanded as a result of the pandemic. Over 40% of adults in low- and middle-income countries (apart from China) who paid a merchant in-person or online with a card, phone, or the internet did so for the first time since the pandemic's commencement. More than a third of persons in low- and middle-income nations who paid a power bill straight from a formal account experienced the same thing. After the pandemic began, more than 80 million adults in India and over 100 million adults in China each made their first digital merchant payment. According to Payment Systems Report published by Nepal Rastra Bank (NRB), 2022. The number of transaction or volume and value or amount of transaction through PSP is shown in the table below.

Table 4.2: No. of Transaction and Amount of Transaction Using PSP

Particulars	No. of Transaction													
	Mid-Month													
	2019/20	2020/21				2021/22								
	Jun-Jul	Apr-May	May-Jun	Jun-Jul	Jul-Aug	Aug-Sep	Sep-Oct	Oct-Nov	Nov-Dec	Dec-Jan	Jan-Feb	Feb-Mar	Mar-Apr	Apr-May
Wallet	10179557	10743511	9750065	12515904	13155501	13203496	13565054	13030804	13088543	13712206	12957353	14033490	14494893	14884701
QR-Based Payments	-	672689	502666	855566	1293349	1577561	1515329	1387584	1649397	1918526	1782363	2307904	2723586	3071843

Particulars	Total Amount (Rs in million)													
	Mid-Month													
	2019/20	2020/21				2021/22								
	Jun-Jul	Apr-May	May-Jun	Jun-Jul	Jul-Aug	Aug-Sep	Sep-Oct	Oct-Nov	Nov-Dec	Dec-Jan	Jan-Feb	Feb-Mar	Mar-Apr	Apr-May
Wallet	10222	10106	8353	12790	14052	14427	15187	13949	15528	16276	14536	16599	15362	14660
QR-Based Payments	-	2529	1968	3651	5056	5857	6097	5362	6282	6525	6892	7762	8942	10191

* Transaction amount of mid-Jul and 1

** Also includes card issued by PSPs

The above table 4.2 shows that from the June to July of FY 2019/20 to April to May of 2022 there is Compound Annual Growth Rate (CAGR) of 20.83% in terms of transaction volume and CAGR of 19.75% in terms of transaction value of wallets and QR based payments in Nepal which is further explained in detail on the figures 4.5 and 4.6 below.

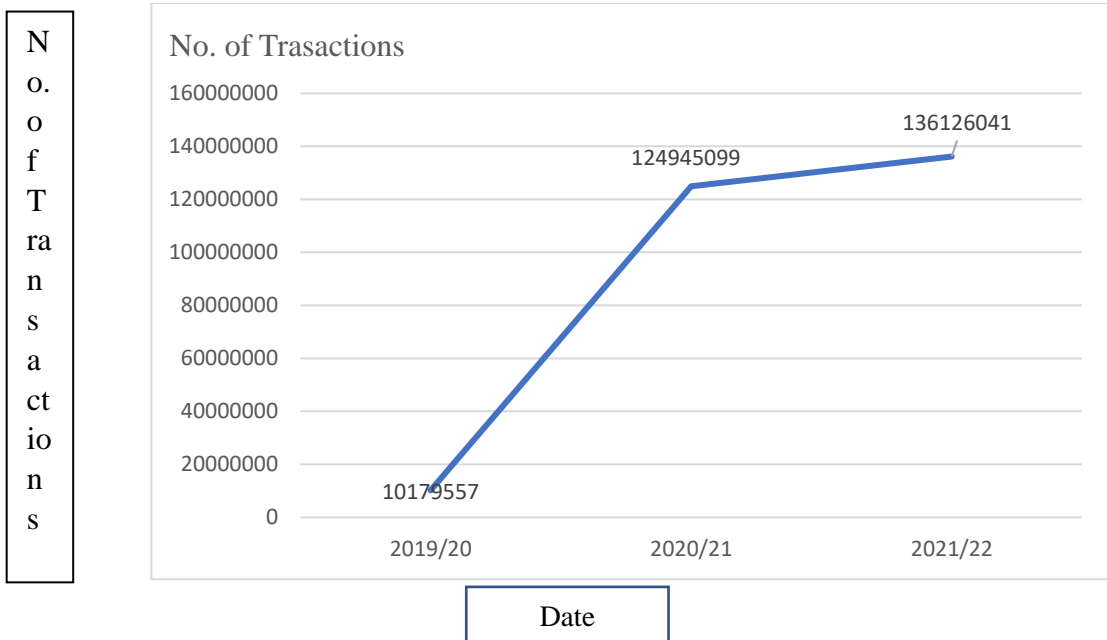


Figure 4.5: No. of Transactions using PSP

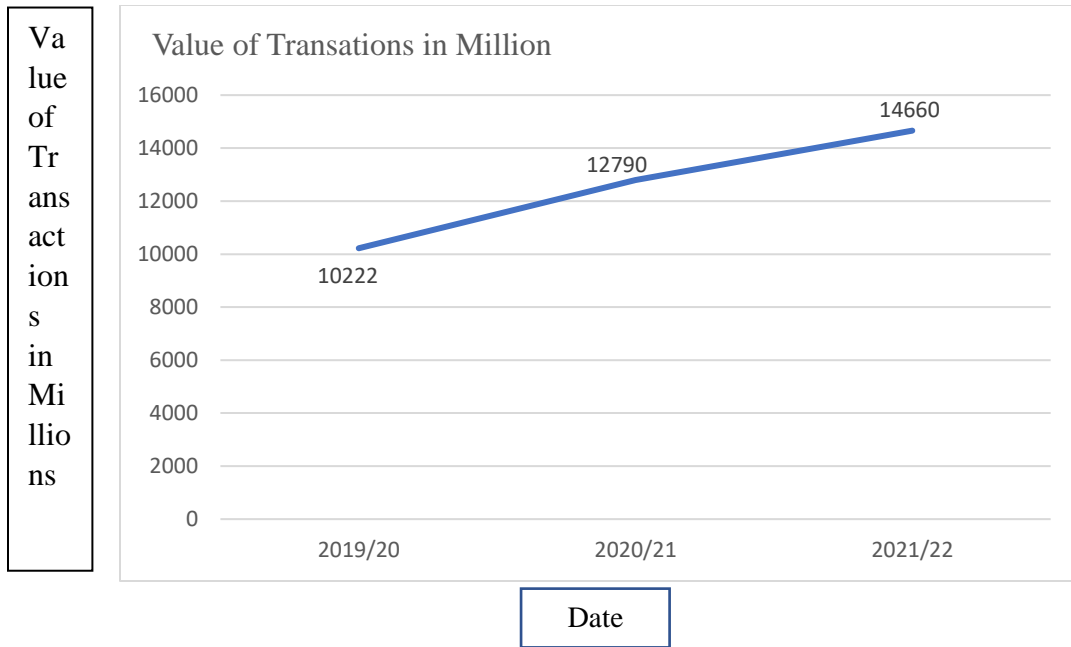


Figure 4.6: Value of Transactions in Million

The above chart is the graphical presentation of the table 4.2 which shows that the growth rate of 52.2% is seen on mid-July 2017 with the highest growth percentage of 90.5 % is seen in mid-July of 2019.

Table 4.3: Usage Frequency and Usage Duration of Respondents

Usage Frequency			Usage Duration		
	Frequency	Percent		Frequency	Percent
Everyday	135	33.3	1-3 Months	45	11.1
Few Times a week	122	30.1	3-6 Months	11	2.7
Few Times a month	106	26.2	6-12 Months	11	2.7
At least once a month	2	0.5	1-2 Years	117	28.9
Only for special occasion	25	6.2	Above 2 Years	221	54.6
Few Times a year	15	3.7	Total	405	100.0
Total	405	100.0			

The table 4.3 represents that from the total participants for usage frequency of PSP majority of them 63.4%) of the respondents use the digital payment everyday or few times a week. Similarly, majority of the respondents (83.5%) have are using digital payment above two years or 1-2 years.

4.4 Respondent’s perception on Security Concern

Security concern refers to the important element for the effectiveness of payment service providers. This study therefore tries to link the perception of respondent on security concern among the users of Kathmandu Valley.

Table 4.4: Respondent’s perception on Security Concern

This table shows the number of responses, percent and mean on the five- point Likert scales: 1 as strongly disagree (SD), 2 as disagree (D), 3 as neutral (N), 4 as agree (A) and 5 as strongly agree (SA). The aggregate percentage of strongly agree and agree is calculated in order to assess the degree of total percentage on agree and the aggregate percentage of strongly disagree and disagree is calculated in order to assess the degree of total percentage on disagree.

Statements		5	4	3	2	1	N	Mean
I consider Security is the most important factor for digital payment systems.	F	268	83	17	20	17	405	4.39
	%	66	21	4	5	4	100	
	A%	87		5	9			
Enhanced security features would increase the effectiveness of e-wallet or digital wallet.	F	183	150	44	22	6	405	4.19
	%	45	37	11	5	2	100	
	A%	82		11	7			
I consider the Digital Wallets or e-wallets are highly secured.	F	78	119	188	16	4	405	3.61
	%	19	29	46	4	1	100	
	A%	58		46	5			
Weighted average mean							4.06	

Source: Field survey

Table 4.4 reveals that majority of the participants (87 percent) agreed that security is the important factor for digital payment, whereas some (5 percent) were neutral towards the statement. However, the remaining (9 percent) of the respondents were disagreed. The

calculated mean value of this statement is 4.5 which indicate that consumer give high priority to security for digital payment.

Regarding the response on the statement, “Enhanced security features would increase the effectiveness of e-wallet or digital wallet.”, majority of the participants (82 percent) agreed that enhancing security features increase the effectiveness of e-wallet whereas some (11 percent) of the participants did not agree with the statement. However, the rest (7 percent) of the respondents neutral with the statement. The calculated mean value is 4.3.

Regarding the statement “I consider the Digital Wallets or e-wallets are highly secured.”, majority (58 percent) of the participants agreed that digital wallets or e-wallets are highly secured, whereas some (5 percent) of the participants disagreed the statement. However, the rest (46 percent) of the participants were neutral toward the statement. The calculated mean value is 3.61.

4.5 Respondent’s perception on Interoperability

The capacity of computer systems or software to communicate and utilize information is referred to as interoperability. This study therefore tries to link the perception of consumer on interoperability in Kathmandu Valley.

Table 4.4 reveals that majority of the participants (58 percent) agreed on the statement, “It is mandatory to have same digital wallet or e-wallet application for sending/receiving payment.”, whereas some (5 percent) were neutral towards the statement. However, the remaining (20 percent) of the participants were disagreed. The calculated mean value of this statement is 3.49.

Regarding the response on the statement, “I feel hassle to use two or more digital wallets or e-wallets applications for payment”, majority of the respondent (66 percent) agreed whereas some (3 percent) of the participants didn’t agree on the statement. However, the rest (23 percent) of the participants neutral with the statement. The calculated mean value of this statement is 3.81.

Regarding the statement “I consider that there should be feature to send money from any digital wallet or e-wallet to any other ones.”, majority (58 percent) of the respondents

agreed the statement, whereas some (8 percent) of the participants disagreed the statement. However, the rest (35 percent) of the participants were neutral on the statement. The calculated mean value of this statement is 4.14.

Table 4.5: Perception of respondents on interoperability

Statements		5	4	3	2	1	N	Mean
It is mandatory to have same digital wallet or e-wallet application for sending/receiving payment	F	81	154	87	52	31	405	3.49
	%	20	38	22	13	7	100	
	A%	58		5	20			
I feel hassle to use two or more digital wallets or e-wallets applications for payment	F	111	157	93	41	3	405	3.81
	%	27	39	23	10	1	100	
	A%	66		23	3			
I consider that there should be feature to send money from any digital wallet or e-wallet to any other ones	F	172	143	69	19	2	405	4.14
	%	30	28	35	4	4	100	
	A%	58		35	8			
Sending/receiving payments from all payments systems benefits all participants in the payments ecosystem	F	163	163	59	13	7	405	4.14
	%	40	40	15	3	2	100	
	A%	80		15	5			
Weighted average mean							3.90	

Regarding the response on the statement, “Sending/receiving payments from all payments systems benefits all participants in the payments ecosystem”, majority of the respondent (80 percent) agreed whereas some (5 percent) of the participant’s disagreed with the statement. However, the rest (15 percent) of the respondents were neutral with the statement. The calculated mean value of this statement is 4.14.

4.6 Respondent’s perception on Customer Service

Interoperability can be referred as the help and guidance given by a business to customers who use or purchase its products or services. This study therefore tries to link the perception of consumer on customer service in Kathmandu Valley.

Table 4.6 presents the perception of respondents on Customer Service.

Statements		5	4	3	2	1	N	Mean
I frequently use customer services offered by digital wallet or e-wallet companies for any query or to solve any issue in payment.	F	88	178	81	44	14	405	3.69
	%	22	44	20	10	4	100	
	A%	66		5	14			
I am satisfied with the overall customer service offered by payment service provider	F	103	111	154	37	0	405	3.69
	%	25	28	38	9	0	100	
	A%	53		38	9			
I consider digital wallet or e-wallet companies should have 365 days 24*7 customer service	F	26	24	30	3	3	405	4.40
	%	30	28	35	4	4	100	
	A%	58		35	8			
Weighted average mean							3.93	

Table 4.6 reveals that majority of the respondents (66 percent) agreed on the statement, “I use customer services offered by digital wallet or e-wallet companies for any query or to solve any issue in payment.”, whereas some (5 percent) of the participants were neutral towards the statement. However, the rest (14 percent) of the participants were disagreed. The calculated mean value of this statement is 3.69.

Regarding the response on the statement, “I am satisfied with the overall customer service offered by payment service provider.”, majority of the participant (53 percent) agreed whereas some (8 percent) of the participants disagreed with the statement. However, the rest (35 percent) of the participants were neutral with the statement. The calculated mean value of this statement is 3.69.

Regarding the statement “I consider digital wallet or e-wallet companies should have 365 days 24*7 customer service.”, majority (58 percent) of the respondents agreed the statement, whereas some (8 percent) of the respondents disagreed the statement. However, the rest (35 percent) were neutral toward the statement. The calculated mean value of this statement is 4.40.

4.7 Respondent's perception on Low Transaction Fee & Merchant Discount Rate (MDR)

Transaction fee refers to amount that is charged by the payment service provider to transfer any amount to the receiver whereas MDR is a fee paid by merchants to Service providers for processing payments which is calculated as a percentage of the transaction. This study therefore tries to link the perception of respondent on Low Transaction Fee & Merchant Discount Rate (MDR) among the users of Kathmandu Valley.

Table 4.7 presents the perception of respondents on Low Transaction Fee & Merchant Discount Rate (MDR).

Statements		5	4	3	2	1	N	Mean
Low MDR will encourage the Merchants to use digital payment to increase efficiency in their business	F	109	88	92	91	25	405	3.40
	%	27	22	23	22	6	100	
	A%	49		5	28			
Transaction Fee & MDR of e-wallets or digital wallets are higher than expected	F	98	200	72	33	2	405	3.88
	%	24	49	18	8	1	100	
	A%	73		18	9			
I feel transaction fee and MDR should be free of cost	F	124	132	88	53	8	405	3.76
	%	31	33	22	13	2	100	
	A%	54		22	15			
Weighted average mean							3.68	

Table 4.7 reveals that majority of the respondents (49 percent) agreed on the statement, “Low MDR will encourage the Merchants to use digital payment to increase efficiency in their business.”, whereas some (5 percent) of the participants were neutral. However, the rest (28 percent) of the respondents were disagreed. The calculated mean value of this statement is 3.40.

Regarding the response on the statement, “Transaction Fee & MDR of e-wallets or digital wallets are higher than expected.”, majority of the respondent (73 percent) agreed whereas some (9 percent) of the respondents disagreed with the statement. However, the rest (18 percent) of the respondents were neutral. The calculated mean value of this statement is

3.88. Regarding the statement “I feel transaction fee and MDR should be free of cost.”, majority (54 percent) of the respondents agreed the statement, whereas some (15 percent) of the respondents disagreed the statement. However, the rest (22 percent) were neutral. The calculated mean value is 3.76.

4.8 Respondent’s perception on Regulatory Constraints

The regulatory bodies are in charge of controlling the flow of money, and they must gather data on transactions in order to control customs charges and taxes. This study therefore tries to link the perception of respondent on regulatory constraints among the users of Kathmandu Valley.

Table 4.8 presents the perception of respondents on Regulatory Constraints

Statements		5	4	3	2	1	N	Mean
I feel hassle to fill up KYC form for digital wallet or e-wallet account registration	F	141	111	81	36	36	405	3.70
	%	35	27	20	9	9	100	
	A%	62		20	18			
I consider the transaction limit per day offered by digital wallet or e-wallets are not satisfactory	F	72	142	143	45	3	405	3.58
	%	18	35	35	11	1	100	
	A%	53		35	12			
I consider regulatory agency should act as facilitator to the digital payment system rather than controller	F	92	102	138	57	16	405	3.48
	%	23	25	34	14	4	100	
	A%	48		34	18			
Weighted average mean							3.59	

Table 4.8 reveals that majority of the respondents (62 percent) agreed on the statement, “I feel hassle to fill up KYC form for digital wallet or e-wallet account registration”, whereas 20 percent of the participants were neutral towards the statement. However, the rest (18 percent) of the respondents were disagreed. The calculated mean value of this statement is 3.70 and regarding the response on the statement, “I consider the transaction limit per day offered by digital wallet or e-wallets are not satisfactory”, majority of the respondent (53

percent) agreed whereas some (12 percent) of the participants did not agree the statement. However, the rest (34 percent) were neutral. The calculated mean value is 3.58.

Regarding the statement “I consider regulatory agency should act as facilitator to the digital payment system rather than controller”, majority (48 percent) of the respondents agreed the statement, whereas some (18 percent) of the participants did not agreed. However, the rest (22 percent) of the respondents were neutral. The calculated mean value is 3.48.

4.9 Respondent’s perception on Cross-border Peer to Peer & Peer to Merchant Transactions

Real time cross-border transaction refers to transfer of money digitally from PSPs of one country to PSPs of another country. This study therefore tries to link the perception of respondent on Cross-border Peer to Peer & Peer to Merchant Transactions among the users of Kathmandu Valley.

Table 4.9 presents the perception of respondents on Cross-border Peer to Peer & Peer to Merchant Transactions

Statements		5	4	3	2	1	N	Mean
I feel transfer of payment through e-wallet across countries will broaden the dynamics of digital payment	F	95	179	87	24	20	405	3.75
	%	24	44	21	6	5	100	
	A%	68		21	11			
I consider this feature will eliminate to depend on third party to buy any product across border with real time payment.	F	158	147	86	11	3	405	4.11
	%	39	36	21	3	1	100	
	A%	75		21	4			
Real time cross-border transaction will benefit all participants in the payments ecosystem	F	146	175	72	9	3	405	3.76
	%	36	43	18	2	1	100	
	A%	79		18	3			
Weighted average mean							3.87	

Table 4.9 reveals that majority of the respondents (68 percent) agreed on the statement, “Cross-border transaction i.e. transfer of payment through e-wallet across countries will

broaden the dynamics of digital payment”, whereas 21 percent of the respondents were neutral towards the statement. However, the rest (11 percent) of the respondents were disagreed. The calculated mean value of this statement is 4.11.

Regarding the response on the statement, “I consider this feature will eliminate to depend on third party to buy any product across border with real time payment.”, majority of the respondent (75 percent) agreed the statement whereas some (4 percent) of the respondents disagreed with the statement. However, the rest (21 percent) were neutral with the statement. The calculated mean value is 4.11.

Regarding the statement “Real time cross-border transaction will benefit all participants in the payments ecosystem”, majority (79 percent) agreed the statement, whereas some (3 percent) didn’t agree. However, the rest (18 percent) of the respondents were neutral. The calculated mean value is 3.76.

4.10 Respondent’s perception on Effectiveness of PSPs

Table 4.10 reveals that majority of the participants (75 percent) agreed on the statement, “The effectiveness of digital wallet or e-wallet system is reflected by its security features.”, whereas (22 percent) were neutral towards the statement. However, the rest (3 percent) of the participants were not agreed. The calculated mean value of this statement is 4.05.

Regarding the response on the statement, “If the network is interoperable, then it is more likely to increase the efficiency of the e-wallets.”, majority of the participants (80 percent) agreed the statement whereas some (4 percent) of the respondents disagreed with the statement. However, the rest (16 percent) were neutral. The calculated mean value is 4.25.

Regarding the statement “I continue to use the e-wallet that has instant customer service.”, majority (78 percent) of the participants agreed the statement, whereas some (2 percent) of the participants did not agree the statement. However, the rest (20 percent) were neutral. The calculated mean value is 4.17.

Regarding the statement “Low Transaction Fee & Merchant Discount Rate (MDR) increase the usability of the e-wallet.”, majority (80 percent) were agreed with the statement,

whereas some (1 percent) didn't agree. However, the remaining (19 percent) were neutral. The calculated mean value is 4.25.

Table 4.10 presents the perception of respondents on Effectiveness of PSPs

Statements		5	4	3	2	1	N	Mean
The effectiveness of digital wallet or e-wallet system is reflected by its security features.	F	136	166	93	8	2	405	4.05
	%	34	41	22	2	1	100	
	A%	75		22	3			
If the network is interoperable, then it is more likely to increase the efficiency of the e-wallets	F	199	127	64	14	1	405	4.25
	%	49	31	16	4	0	100	
	A%	80		16	4			
I continue to use the e-wallet that has instant customer service.	F	170	147	80	4	4	405	4.17
	%	42	36	20	1	1	100	
	A%	78		20	2			
Low Transaction Fee & Merchant Discount Rate (MDR) increase the usability of the e-wallet.	F	187	138	78	0	2	405	4.25
	%	46	34	19	0	1	100	
	A%	80		19	1			
Regulatory constraints minimization is necessary for increment of efficiency of e-wallets.	F	181	115	99	8	2	405	4.14
	%	45	28	24	2	1	100	
	A%	73		24	2			
Cross-border Peer to Peer & Peer to Merchant Transactions broader the dimension and increase the value of digital wallets.	F	140	111	109	44	1	405	3.85
	%	35	27	27	11	0	100	
	A%	62		27	11			
Weighted average mean							4.12	

Regarding the statement “Regulatory constraints minimization is necessary for increment of efficiency of e-wallets”, majority (73 percent) of the respondents were agreed with the statement, whereas some (2 percent) were not agreed. However, the remaining (24 percent) were neutral toward the statement. The calculated mean value is 4.14.

Regarding the statement “Cross-border Peer to Peer & Peer to Merchant Transactions broader the dimension and increase the value of digital wallets”, majority (62 percent) of the participants were agreed, whereas some (11 percent) were not agreed. However, the remaining (27 percent) were neutral. The calculated mean value is 3.85.

4.11 Descriptive Analysis of Variables

In the table below, mean and standard deviation of all dependent variables which are components of effectiveness of PSPs are shown. The data's dispersion from the mean is measured by the standard deviation. Security concern has mean value of 4.0683 and standard deviation of 0.76214. Interoperability has average value of 3.9012 and standard deviation of 0.73655. Customer Service has mean of 3.9325 and standard deviation of 0.75259. Low transaction fee and Merchant Discount Rate (MDR) has average value of 3.6872 and the standard deviation value of 0.8132. Regulatory constraints has mean of 3.5901 and standard deviation of 0.88777. Cross-border Peer to Peer and Peer to Merchant has mean of 3.9901 and standard deviation of 0.75007.

Table 4.11: Descriptive Analysis of Variables

	SC	IO	CS	LTFM	RC	CPTM
N	405	405	405	405	405	405
Mean	4.0683	3.9012	3.9325	3.6872	3.5901	3.9901
Std. Deviation	0.76214	0.73655	0.75259	0.86132	0.88777	0.75007

4.12 Normality Test

Normality test for the Likert scale data is done using SPSS and if there is normal distribution of data, Linear Regression and Pearson Correlation method is used or else Ordinal Regression and Spearman Rank Correlation is used to analyze and interpret Likert Scale questionnaire response (Hair Jr. et al., 2017). For the test of normality, the results of two tests Kolmogorov-Smirnov and Shapiro-Wilk test is shown in the Table 4.12 below. Since, for the data greater than 50, Kolmogorov-Smirnov test of normality is considered. For the result the Null hypothesis is the data are normally distributed. So, if the value of alpha is greater than 0.05 at 95% confidence interval the null hypothesis is accepted but

here all the variables have alpha value less than 0.05 so the alternate hypothesis is selected which the data follows non-normal distribution.

Table 4.12: Normality Test

Tests of Normality						
	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
EP	0.137	405	0.000	0.936	405	0.000
SC	0.277	405	0.000	0.762	405	0.000
IO	0.152	405	0.000	0.940	405	0.000
CS	0.170	405	0.000	0.932	405	0.000
LTFM	0.128	405	0.000	0.954	405	0.000
RC	0.120	405	0.000	0.961	405	0.000
CPTM	0.106	405	0.000	0.923	405	0.000

This table shows dependent variable EP as Effectiveness of PSPs, and independent variables SC as Security Concern, IO as Interoperability, CS as Customer Service, LTFM as Low Transaction Fee and Merchant discount Rate, RC as Regulatory Constraints and CPTM as Cross-Border Peer to Peer and Peer to Merchant Transaction

The Kolmogorov-Smirnov test is the least effective test for distribution, whereas the Shapiro-Wilk test is the most effective. Shapiro-Wilk test power is still poor due to the tiny sample size, though. The use of formal normality tests and an examination of shape factors like skewness and kurtosis coefficients should be supplemented with graphical tools (Normadiah, et al., 2011).

Table 4.13: Skewness and Kurtosis Values

		Absolute Value
EP		
	Skewness	-0.19058
	Kurtosis	1.682552
SC		
	Skewness	-15.8589
	Kurtosis	16.13755
IO		
	Skewness	-4.04645
	Kurtosis	1.620622

CS		
	Skewness	-3.22552
	Kurtosis	-1.47445
LTFM		
	Skewness	-2.42618
	Kurtosis	-1.59491
RC		
	Skewness	-3.45724
	Kurtosis	-1.22313
CPTM		
	Skewness	-5.23558
	Kurtosis	4.040891

The value of an absolute value larger than 1.96 or less than -1.96 for Skewness and Kurtosis is significant at a P value of 0.05, greater than 2.58 or less than -2.58 at a P value of 0.01 and greater than 3.29 or less than -3.29 at a P value of 0.001. Values greater than 1.96 or lower than -1.96 are sufficient in small samples to prove the data's normalcy. This requirement should be modified to 2.58 in big samples (200 or more) with tiny standard errors, though (Ghasemi A, Zahediasl S., 2012). Since, all the absolute values falls out of the range of ± 2.58 the data follow non-normal distribution. Hence, Spearman Rank Correlation and Ordinal Regression is used to analyze and interpret Likert Scale questionnaire response.

4.13 Correlation Analysis

The term "correlation" describes how closely two variables are related to one another. A strong or high correlation indicates a significant association between two or more variables, whereas a weak or low correlation indicates that the variables are rarely related. The correlation result of effectiveness of Payment Service Providers is as presented in Table 4.4.

Table 4.14: Spearman's Correlation Matrix

This table presents Spearman's Correlation coefficients between dependent variable and independent variables. The correlation coefficients are based on 405 observations. The dependent variable is EP (Effectiveness of PSPs). The independent variables are SC (Security Concern), IO (Interoperability), CS (Customer Service), LTFM (Low Transaction Fee and Merchant discount

Rate), RC as (Regulatory Constraints) and CPTM (Cross-Border Peer to Peer and Peer to Merchant Transaction)

Variables		EP	SC	IO	CS	LTFM	RC	CPTM
EP	Correlation Coefficient	1.000						
	Sig. (2-tailed)							
	N	405						
SC	Correlation Coefficient	.388**	1.000					
	Sig. (2-tailed)	0.000						
	N	405	405					
IO	Correlation Coefficient	.379**	.228**	1.000				
	Sig. (2-tailed)	0.000	0.000					
	N	405	405	405				
CS	Correlation Coefficient	.396**	.488**	.492**	1.000			
	Sig. (2-tailed)	0.000	0.000	0.000				
	N	405	405	405	405			
LTFM	Correlation Coefficient	.425**	.297**	.452**	.471**	1.000		
	Sig. (2-tailed)	0.000	0.000	0.000	0.000			
	N	405	405	405	405	405		
RC	Correlation Coefficient	.380**	.351**	.328**	.554**	.315**	1.000	
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000		
	N	405	405	405	405	405	405	
CPTM	Correlation Coefficient	.784**	.383**	.431**	.321**	.374**	.451**	1.000
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	
	N	405	405	405	405	405	405	405

Notes: The asterisk signs (**) and (*) indicate that the results are significant at one percent and five percent level respectively.

Relationship between Effectiveness of PSPs and Security Concern

The result from the table 4.3 shows the value of correlation coefficient between dependent variable, i.e., effectiveness of PSPs, has a value of 0.388 with security concern. The value of correlation coefficient which is equals to 0 indicates no relationship and the value equals to 0.6 indicates a moderate positive relationship. Since, the correlation coefficient value is greater than 0 and less than 0.6, there is somewhat positive relationship between effectiveness of PSPs and security concern. The positive relation implies that if the value of one variable increase, the value of the other variable will also increase.

Relationship between Effectiveness of PSPs and Interoperability

The result from the table 4.3 reveals that the value of correlation coefficient between dependent variable, i.e., effectiveness of PSPs, has a value of 0.379 with interoperability. The value of correlation coefficient which is equals to 0.6 indicates a moderate positive relationship and value equals to 0.8 indicates a fairly strong and positive relationship. The value of the correlation coefficient is greater than the 0 and less than 0.6, there is somewhat positive relationship between effectiveness of PSPs and interoperability. The positive relation implies that if the value of one variable increase, the value of the other variable will also increase.

Relationship between Effectiveness of PSPs and Customer Service

The result from the table 4.3 concludes that the value of correlation coefficient between dependent variable, i.e., effectiveness of PSPs, has a value of .396 with Customer Service. The value of correlation coefficient which is equals to 0.6 indicates a moderate positive relationship and value equals to 0.8 indicates a fairly strong and positive relationship. The value of the correlation coefficient is greater than 0.6 and less than 0.8, there is somewhat a positive relationship between effectiveness of PSPs and the Customer Service. The positive relation implies that if the value of one variable increase, the value of the other variable will also increase.

Relationship between Effectiveness of PSPs and Low Transaction Fee & Merchant Discount Rate (MDR)

The result from the table 4.3 computes that the value of correlation coefficient between dependent variable, i.e., effectiveness of PSPs, has a value of 0.425 with Low Transaction Fee & Merchant Discount Rate (MDR). The value of correlation coefficient which is equals to 0 indicates no relationship and the value equals to 0.6 indicates a moderate positive relationship. Since, the correlation coefficient value is greater than 0 and less than 0.6, there is moderate positive relationship between Effectiveness of PSPs and Low Transaction Fee & Merchant Discount Rate (MDR). The positive relation implies that if the value of one variable increase, the value of the other variable will also increase.

Relationship between Effectiveness of PSPs and Regulatory Constraints

The result from the table 4.3 computes that the value of correlation coefficient between dependent variable, i.e., effectiveness of PSPs, has a value of .380 with Regulatory Constraints. The value of correlation coefficient which is equals to 0 indicates no relationship and the value equals to 0.6 indicates a moderate positive relationship. Since, the correlation coefficient value is greater than 0 and less than 0.6, there is somewhat positive relationship between Effectiveness of PSPs and Regulatory Constraints. The positive relation implies that if the value of one variable increase, the value of the other variable will also increase.

Relationship between Effectiveness of PSPs and Cross-border Peer to Peer & Peer to Merchant Transactions

The result from the table 4.3 computes that the value of correlation coefficient between dependent variable, i.e., effectiveness of PSPs, has a value of 0.784 with Cross-border Peer to Peer & Peer to Merchant Transactions. The value of correlation coefficient which is equals to 0.6 indicates a moderate positive relationship and value equals to 0.8 indicates a fairly strong and positive relationship. Since, the correlation coefficient value is greater than 0.6 and less than 0.8, there is positive relationship between Effectiveness of PSPs and Cross-border Peer to Peer & Peer to Merchant Transactions. The positive relation implies that if one variable increase in value, the other variable will also increase in value.

Thus, the study result reveals that among the six variables, there is a high degree of correlation in effectiveness of PSPs with cross-border Peer to Peer & Peer to Merchant Transactions and low transaction fee & Merchant Discount Rate (MDR). Similarly, the study also indicates that there is less degree of correlation in effectiveness of PSPs with security concern and interoperability.

4.14 Test of Hypothesis- Ordinal Regression Analysis

Table 4.15: Model Fitting Information

Model	Chi-Square	df	Sig.
Intercept Only			
Final	405.322	6	0.000

Table 4.16: Result of Hypothesis via Ordinal Analysis

Model	Estimate	Std. Error	df	Sig.
SC	0.13	0.128	1	0.308
IO	-0.206	0.149	1	0.165
CS	0.434	0.164	1	0.008
LTFM	0.342	0.122	1	0.004
RC	-0.145	0.124	1	0.241
CPTM	3.201	0.203	1	0.000

Dependent Variable: EP

As the values of the independent variable rise, there is a lower likelihood that the dependent variable would fall at a greater level, which is how the negative estimate or coefficient is read. A positive estimate or coefficient is regarded as a rise in the independent variable's value and an increased likelihood that the dependent variables would fall at a greater level. Log odds tell us how likely it is that something particular will happen.

According to the study findings, (Estimate= 0.13, $P > 0.05$) there was positive insignificance relation between security concern and effectiveness of PSP, it means the security concern could not significantly influence the effectiveness of PSPs. (Estimate= -0.26, $P > 0.05$) there was negative insignificant relation between interoperability and effectiveness of PSPs, it means that if there is one unit increase in interoperability, there is

a predicted decrease of 0.26 in the log odds of being on a higher level of effectiveness of PSPs. (Estimate=0.434, $P<0.05$) there was positive and significant relation between customer service and effectiveness of PSPs, It suggests that for every unit gain in customer service, the log probabilities of PSPs being more effective are anticipated to increase by 0.434. (Estimate= 0.342, $P<0.05$) there was positive and significant relation between low transaction fee and MDR, It suggests that for every unit rise in low transaction cost and MDR, the log probabilities of PSPs being more effective are anticipated to increase by 0.342. (Estimate= -0.145, $P<0.241$) there was negative insignificant relation between regulatory constraints and effectiveness of PSPs, Consequently, there is a predicted reduction of 0.241 in the log odds of being on a higher level of PSP effectiveness for every unit rise in regulatory limitations. (Estimate = 3.201, $P<0.05$) there was positive and significant relation between cross-border peer to peer & peer to merchant transaction and effectiveness of PSPs, It indicates that for every unit rise in cross-border peer-to-peer and peer-to-merchant transactions, the log probabilities of PSPs being more effective are anticipated to increase by 0.434.

Table 4.17: Hypothesis Result Summary

Hypothesis No.	Statement	Result
H ₁	Security Concern has a positive and significant effect on effectiveness of PSPs.	Reject
H ₂	Interoperability has a positive and Significant effect on effectiveness of PSPs.	Reject
H ₃	Customer Service has a positive and significant effect on effectiveness of PSPs	Accept
H ₄	Low Transaction Fee & MDR has a positive and significant effect on effectiveness of PSPs	Accept
H ₅	Regulatory Constraints has a positive and significant effect on effectiveness of PSPs	Reject
H ₆	Cross-border P2P & P2M Transactions has a positive and significant effect on effectiveness of PSPs	Accept

In order to examine the information gathered from 405 individuals, an ordinal regression was used. A synopsis of the hypothesis testing results is shown in Table 4.16 Three out of six hypotheses were accepted. In that, the hypotheses H_3 , H_4 and H_6 were accepted, while hypotheses H_1 , H_2 and H_5 were found to be rejected from proposed model.

4.15 Second Route Result

The key difference between route-one and route two result is the Exponential of B column. The odds ratios was obtained keeping the other independent variables fixed, the multiplicative increases in the odds of falling into a higher category for each unit increase in the independent variable are shown in the Exp(B) column.

Table 4.18: Second Route Result

Model	B	Std. Error		Exp(B)
			df	
SC	0.13	0.12	1	1.139
IO	-0.206	0.1534	1	0.814
CS	0.434	0.162	1	1.544
LTFM	0.342	0.133	1	1.408
RC	-0.145	0.1167	1	0.865
CPTM	3.201	0.2203	1	24.548

Dependent Variable: EP

- Exp(B) an odd ratio >1 shows that when values of an independent variable grow, the likelihood of being in a higher level on the dependent variable would also increase.
- Exp(B) an odd ratio <1 shows that the likelihood will decrease as the value of an independent variable increases.
- Exp(B) an odd ratio $= 1$ implies that as values of an independent variable rise, there is no expected change in the likelihood of being in a higher category.

The above Table 4.17 indicates that the odds of being in a higher level on effectiveness of PSPs increases by 1.139, 1.544, 1.408 and 24.548, for every one unit increase in SC, CS, LTFM and CPTM respectively whereas Exp(B)= 0.814 of IO and Exp(B) = 0.865

of RC indicates as IO and RC values rise, there is a diminishing likelihood of being in a higher level while the effectiveness of the PSPs is increasing.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The goal of this research is to examine the recent trends and adoption of PSPs and to analyze the factors influencing the effectiveness of PSPs in Kathmandu valley along with its future prospects. This study also aims to explore the challenges to the PSPs with the entrance of Unified Payment Interface (UPI) in Nepal. Digital payment system is changing perception and way of transaction with technology and innovation. Using digital tools in payment systems makes numerous industries more engaging, accessible, creative, efficient, and productive, which is what drives the nation's economic growth.

Firstly, findings of the study conclude that there was rising trends and adoption of PSPs among the users in Kathmandu valley with maximum respondents (54.6 %) are using the PSPs for more than 2 years and more than 33% of them using it every day. Furthermore, according to Current Macroeconomic and Financial Situation Report published by NRB, 2022 there is Compound Annual Growth Rate (CAGR) of 20.83% in terms of transaction volume and CAGR of 19.75% in terms of transaction value of digital payment which shows the high adoption rate of PSPS.

Secondly, the conceptual model of the research consists of Security concern, Interoperability, Customer Service, Low Transaction cost and MDR, regulatory constraints and cross-border peer to peer & peer to merchant transactions as independent variables and effectiveness of PSPs as dependent variables. Out of the six hypothesized associations in the research model, 3 supported hypotheses presented relationships between the dependent and independent variables of the model. The study concluded that the effectiveness of PSPs would increase if the PSPs can deliver Cross-border Peer to Peer & Peer to Merchant Transactions feature with real time customer service and reducing the Transaction Fee & Merchant Discount Rate (MDR) to least possible. However, consumers and merchants does not found security, interoperability as important factors for determining effectiveness of PSPs. The discrepancy of such result could be due to sparse number of respondents that can affect the outcome as well the sample frame for this study could be unaware of the security concern and interoperability principles in digital payments also, they might have minimal digital literacy although have the knowledge to operate and use digital payment

system. The study concluded that the one of the major players i.e. regulatory body should facilitate the operation of PSPs rather than only controlling them by minimizing the constraints. The study revealed that eSewa is the most popular brand among other PSPs.

Thirdly, the route two result shows Cross-border Peer to Peer & Peer to Merchant Transactions has highest Exp(B) value of 24.548 concluding that this variable is reflecting the highest multiplicative changes on dependent variable compared to all other ones. Since, the entrance of Unified Payment Interface (UPI) will enable a feature of Cross-border Peer to Peer & Peer to Merchant Transactions in Nepal which shows the high probability that the PSPs in Nepal can face hard challenges with entrance of PSOs with Open Innovation such as UPI. Hence, the future landscape of digital wallets can be consolidation, diversification, and penetration. The outcomes of the study offer that Cross-border Peer to Peer & Peer to Merchant Transactions highly influence the effectiveness of PSPs and none of the PSPs have such feature at present. In such situation the entrance of Unified Payment Interface (UPI) will create a threat in the PSP industry. Furthermore, the PSPs should focus on enhancing the customer service and offering low Transaction Fee & Merchant Discount Rate (MDR).

Since, PSP industry outlook also depend on regulatory policies, both the parties i.e. PSPs and regulatory body need to actively work to design more facilitating policy frameworks. The market potential of the PSPs is huge and still many sectors are unexplored. Hence, the player who moves first and innovates continuously will be able to capitalize on the opportunities.

5.2 Recommendations

Further studies can be carried out in different areas which has been listed below:

- i. Research can also be carried out for study of effectiveness of different industries in Nepal such as Manufacturing Industry, Banking Industry, E-commerce business, Hotel and restaurants and so on.
- ii. Further, large sample size including Merchants and consumers having satisfactory digital literacy on the principles of operation of digital payment could be taken for the study purpose.

- iii. Further research can be conducted to identify the effectiveness of the PSPs based upon the researched indicators.
- iv. This study is based on Kathmandu Valley thus, further it can be conducted in other cities as well as rural areas of Nepal
- v. Further research can add additional variables in the current framework.
- vi. Current study is based on convenient sampling; further other forms of sampling technique can be included for the collection of data.

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APPENDIX I: Questionnaire for Survey

Section I: Demographic and Familiarity with PSP

1. What is your age group?
 - a. Under 25
 - b. 26-30
 - c. 31-35
 - d. 36-40
 - e. 41-45
 - f. Above 46
2. What is your gender?
 - a. Male
 - b. Female
3. What is monthly income of your family (in NPR)?
 - a. Rs. 20000 & below
 - b. Rs. 21000-40000
 - c. Rs. 41000-60000
 - d. Rs. 61000-80000
 - e. Above 80000
4. What is your education level?
 - a. Intermediate and below
 - b. Bachelor Degree
 - c. Master Degree
 - d. M. Phil/ Ph. D Degree
5. Do you have access to internet service?
 - a. Yes
 - b. No
6. Have you used digital wallet for payment?
 - a. Yes
 - b. No
7. How long have you been using digital wallet?

- a. 1-3 Months
 - b. 3-6 Months
 - c. 6-12 Months
 - d. 1-2 Years
 - e. Above 2 Years
8. Which kind of payment you do mostly via digital wallet?
- a. Grocery
 - b. Clothing
 - c. Transportation
 - d. Hotel/Restaurant's Bills
 - e. Other
9. What kinds of product do you usually buy online?
- a. Electronics
 - b. Clothing
 - c. Grocery
 - d. Beauty Products
 - e. Others
10. What is your frequency of using digital wallet?
- a. Everyday
 - b. Few times a week
 - c. Few times a month
 - d. Once at least a month
 - e. Only for special occasion
 - f. Few times a year

Section II: Please select options indicating to which degree you agree or disagree with each of the following statements ranked in order 5: Strongly Agree, 4: Agree, 3: Neutral, 2: Agree, and 1: Strongly Disagree

Variable	Question	Scale
Security Concern (SC)	I consider Security is the most important factor for digital payment systems.	5 4 3 2 1
	Enhanced security features would increase the effectiveness of e-wallet or digital wallet.	5 4 3 2 1
	I consider the Digital Wallets or e-wallets are highly secured.	5 4 3 2 1
Interoperability (IO)	It is mandatory to have same digital wallet or e-wallet application for sending/receiving payment.	5 4 3 2 1
	I feel hassle to use two or more digital wallets or e-wallets applications for payment.	5 4 3 2 1
	I consider that there should be feature to send money from any digital wallet or e-wallet to any other ones.	5 4 3 2 1
	Sending/receiving payments from all payments systems benefits all participants in the payments ecosystem.	5 4 3 2 1
Customer Service (CS)	I frequently customer services offered by digital wallet or e-wallet companies for any query or to solve any issue in payment.	5 4 3 2 1

	I am satisfied with the overall customer service offered by payment service provider.	5	4	3	2	1
	I consider digital wallet or e-wallet companies should have 365 days 24*7 customer service.	5	4	3	2	1
Low Transaction Fee & Merchant Discount Rate (LTFM)	Low MDR will encourage the Merchants to use digital payment to increase efficiency in their business.	5	4	3	2	1
	Transaction Fee & MDR of e-wallets or digital wallets are higher than expected.	5	4	3	2	1
	I feel transaction fee and MDR should be free of cost.	5	4	3	2	1
Regulatory Constraints (RC)	I feel hassle to fill up KYC form for digital wallet or e-wallet account registration	5	4	3	2	1
	I consider the transaction limit per day offered by digital wallet or e-wallets are not satisfactory	5	4	3	2	1
	I consider regulatory agency should act as facilitator to the digital payment system rather than controller	5	4	3	2	1
Cross-border Peer to Peer &	I feel Transfer of payment through e-wallet across countries will broaden the dynamics of digital payment.	5	4	3	2	1

Peer to Merchant Transactions (CPTM)	I consider this feature will eliminate to depend on third party to buy any product across border with real time payment.	5	4	3	2	1
	Real time cross-border transaction will benefit all participants in the payment's ecosystem	5	4	3	2	1
Effectiveness of PSPs (EP)	The effectiveness of digital wallet or e-wallet system is reflected by its security features.	5	4	3	2	1
	If the network is interoperable, then it is more likely to increase the efficiency of the e-wallets	5	4	3	2	1
	I continue to use the e-wallet that has instant customer service.	5	4	3	2	1
	Low Transaction Fee & Merchant Discount Rate (MDR) increase the usability of the e-wallet.	5	4	3	2	1
	Regulatory constraints minimization is necessary for increment of efficiency of e-wallets.	5	4	3	2	1
	Cross-border Peer to Peer & Peer to Merchant Transactions broader the dimension and increase the value of digital wallets.	5	4	3	2	1