A Study Report on the USSD-based Payment System and its Regulations: Suggestions for Nepal

Nepal Rastra Bank

Payment Systems Department

January, 2024

Foreword

This report is prepared in alignment with Action 3, Strategy 2, Objective 2 of Strategic Pillar 4 of the Nepal Ratsra Bank's Strategic Plan, 2022-2026. The objective of the report is to evaluate the feasibility and implications of implementing a USSD-based payment system in Nepal. The analysis includes a comprehensive review of the technical architecture and regulatory frameworks for successful USSD payment systems globally. The study provides policy recommendations for USSD-based payment system and delineates the roles of key stakeholders for the effective implementation of USSD-based mobile financial services in Nepal.

I would like to thank **Director Niva Shrestha, Director Laxmi Prasad Prasai, Director (I.T.) Krishna Ram Dhunju, Deputy Director Pushkar Raj Bhattarai, and Assistant Director Rajesh Paneru** for their untiring efforts and hard work to complete this report. I am hopeful that this study will provide valuable insights and information to stakeholders.

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List of Abbreviations

AI	Artificial Intelligence
App	Application
API	Application Programming Interface
ATM	Automated Teller Machine
BFIs	Banks and Financial Institutions
BHIM	Bharat Interface for Money
CAPEX	Capital Expenditure
CGAP	Consultative Group to Assist the Poor
CNIC	Computerized National Identity Card
DDL	Digital Development Level
EDD	Enhanced Due Diligence
GB	Gigabyte
GDP	Gross Domestic Product
GON	Government of Nepal
GSM	Global System for Mobile Communication
GUI	Graphic User Interface
G2P	Government-to-Person
IFC	International Finance Corporation
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
IPS	Inter-bank Payment System
ITU	International Telecommunication Union
IVR	Interactive Voice Response
KYC	Know Your Customer
ML	Machine Learning
MNO	Mobile Network Operator
MPO	Mobile Payment Operator
MSISDN	Mobile Station International Subscriber Directory Number
NCHL	Nepal Clearing House Limited
NCSI	National Cyber Security Index

NDPC	Nepal Digital Payments Company
NGN	Nigerian Naira
NPCI	National Payments Corporation of India
NRB	Nepal Rastra Bank
NSO	National Statistical Office
NTA	Nepal Telecommunication Authority
OTC	Over-the-counter
P2P	Person-to-Person
PIN	Personal Identification Number
PSD	Payment Systems Department
PSO	Payment System Operator
PSP	Payment Service Provider
QR	Quick Response
RURA	Rwanda Utilities Regulatory Agency
SAMN	South Asia Micro-Entrepreneurs Network
SBP	State Bank of Pakistan
SMS	Short Messaging Service
SSAs	Social Security Allowances
STK	SMS Tool Kit
TAT	Turn-around-time
TMFB	Tameer Microfinance Bank
TRAI	Telecom Regulatory Authority of India
UI/UX	User Interface/ User Experience
UPI	Unified Payments Interface
USD	United States Dollar
USSD	Unstructured Supplementary Service Data
WAP	Web Application Protocol
2FA	Two-factor Authentication

1. Introduction

Mobile phones have become an indispensable tool for spurring digital financial services. As Bill Gates stated, "Banking is necessary, but banks are not"[1]; mobile phones have allowed financial transactions based on mobile telephony, without the need for physical branches for banking. Thus, mobile-based financial service providers have adopted varying technologies for enabling digital financial services. Such technologies include Short Messaging Service (SMS), Unstructured Supplementary Service Data (USSD), Interactive Voice Response (IVR), Wireless Application Protocol (WAP), SIM Tool Kit (STK), mobile financial applications, Artificial Intelligence (AI), and Machine Learning (ML) models, among others.

The USSD channel for payments allows making financial transactions using basic feature mobile phone, without the need for internet connectivity. It is one of the most widely used means of offline payments, aiming at financial deepening and inclusion of the marginalized and under-banked population in mainstream banking services. It is a protocol used by the Global System for Mobile Communication (GSM) network to communicate with payment service providers' platform. USSD is a session based, real time messaging communication technology, which can be accessed through a string, starting normally with an asterisk (*) and ending with a hash (#), for instance *500#. USSD sessions are relatively shorter than SMS or IVR, and unlike SMS, it does not store any data on the mobile phone or in the application. Due to the short turnaround time and data privacy, USSD technology is considered a cost-effective, faster, and handset-agnostic mode of payments (Friday, Abduirasaq, & Mary, 2023).

Most countries began with USSD or STK channel for digital financial transactions[2]. As the internet and smartphones became accessible and affordable, new technologies like WAP, Application Programming Interface (API), and Graphic User Interface (GUI)-based mobile applications (apps) evolved to offer faster, more convenient, and easier payment channels to customers. In Africa, the USSD channel has been instrumental in spurring financial inclusion for the underserved and the unbanked population. USSD-based payments rose by 40 percent between 2017 to 2020, with an estimated 6.7 billion number of transactions worth USD 65.7 billion in 2020. This marked a substantial increase from the 5.7 billion number of transactions worth USD 21.4 billion in 2017 (Ashirifi, 2023).

[1] BIS (2016)
[2] See Box 1

Mobile network operators (MNOs) and payment service providers (PSPs), such as banks and financial institutions (BFIs) and non-bank financial institutions, are part of related markets-mobile communication and financial services. In many countries, MNOs have also entered the banking space as neobanks/ digital banks[3].

Box 1: Some payment systems that began with the USSD channel

M-Pesa

M-Pesa was launched in 2007 in Kenya as a mobile money transfer service by Safaricom. M-Pesa has also been implemented in Tanzania, South Africa, and Afghanistan. In Kenya, M-Pesa began with STK technology[4], while in Tanzania USSD was used[5]. Over the years, as internet has become accessible and affordable, M-Pesa is available through additional channels such as M-Pesa Super App, MySafaricom App, and M-Pesa API[6].

Easypaisa

Easypaisa was launched on October 15, 2009 as a joint venture of Telenor-Pakistan and Tameer Microfinance Bank (TMFB). TMFB deployed a branchless banking platform solution developed by Fundamo (which is owned by TMFB) to support Easypaisa transactions. The Fundamo platform is hosted at Telenor-Pakistan in Islamabad, where it is integrated with the USSD platform[7]. By the end of 2011, Easypaisa had facilitated over 39 million transactions worth USD 844 million. Easypaisa started with over-the-counter (OTC)-services as customers were accustomed to OTC services. Most services offered through Easypaisa did not require a mobile account or a Telenor SIM; such services could be rendered through agents, and thus customers did not need to understand the USSD menus for making payments (SAMN, 2013). Easypaisa now offers financial services through wide channels including mobile app.

bKash

bKash was established in 2010 as a joint venture between Money in Motion LLC (an American company set up by two brothers Kamal and Iqbal Quadir) and BRAC Bank, a commercial bank in Bangladesh focused on small and medium enterprises. bKash was established with an agent and USSD model. To open a bKash account, customer visits bKash agent and fills the Know Your Customer (KYC) form prescribed by Bangladesh's central bank. The agent registers customer and customer receives a text message confirming account opening information. Customer activates account by dialing *24# and then sets a unique 4/5 digit Personal Identification Number (PIN) to access the ewallet (IFC, 2016). In 2019, bKash NEXT app was launched, considering the increasing use of internet in Bangladesh[8].

[3] STC Pay of Saudi Arabia is an MNO-operated Digital Bank established to build on the reach of its parent's non-financial activities (AFI, 2021).
[4] Mas & Radcliffe (2010)
[5] ITU (2013)
[6] Information available at https://www.safaricom.co.ke/personal/m-pesa
[7] Although the Fundamo branchless banking platform is integrated with Telenor-Pakistan's USSD platform, Telenor-Pakistan does not have access to the data recorded on Fundamo platform. TMFB and Telenor-Pakistan share specific transaction-related data at a specified frequency with each other with due consideration to confidentiality of customers' information (SAMN, 2013).
[8] As per World Bank, Country Data, 2022, in Bangladesh, the percent of population using internet increased significantly from 4.5 percent in 2011 to 27.8 percent in 2019. In 2021, 39% of the population had access to internet (The World Bank, 2021).

Particulars	2010	2011	2012	2013	2014	2015	2016	2019	2018	2019
Individuals using the Internet (% of population)	3.7	4.5	5.0	6.6	11.9	12.9	18.1	19.8	23.4	27.8

MNOs own a variety of infrastructures required by the mobile payment operators (MPOs)/PSPs; such infrastructures may include the following:

- Mobile communication and connectivity channels, such as cellphone connectivity, 4G/LTE or 5G services, and USSD channels for low-cost access to payments through any phone.
- Retail agent networks of MNOs for cash-in/cash-out services provided by MPOs/PSPs.

In many countries, MNOs are increasingly entering the financial services sphere by offering USSD-based channels for digital financial services. As they own the underlying infrastructure (USSD Gateway) and have an extensive retail agent network, these players can greatly enhance financial inclusion by offering financial services through basic feature phones to their widespread customers. However, MNOs are often criticized for denying USSD access to market players and favoring entities with their direct stake (CGAP, 2015).

Furthermore, when MNOs are directly allowed to operate USSD-based payment services, they pose significant competitive pressure on MPOs/PSPs that do not own infrastructures and market base as owned by MNOs. Thus, there is an active role of regulation to control unfair practices from MNOs directly entering the digital financial services market.

Moreover, a multi-disciplinary regulatory framework may be needed, given the involvement of players regulated by multiple authorities (telecom operators are regulated by the Telecommunication Authority, and financial service providers are regulated by the Central Bank).

The Fourth Strategic Plan 2022-2026 of Nepal Rastra Bank (NRB) has mentioned promoting digital payments and driving innovations as one of the key objectives of the Payment Systems Department (PSD). As per the Strategic Pillar 4, Objective 2, Strategy 2, Action 3, NRB intends to issue directives on USSD for payment institutions by the end of 2024. In line with the action plan, this study intends to identify the appropriate regulatory provisions for USSD-based payment systems for Nepal.

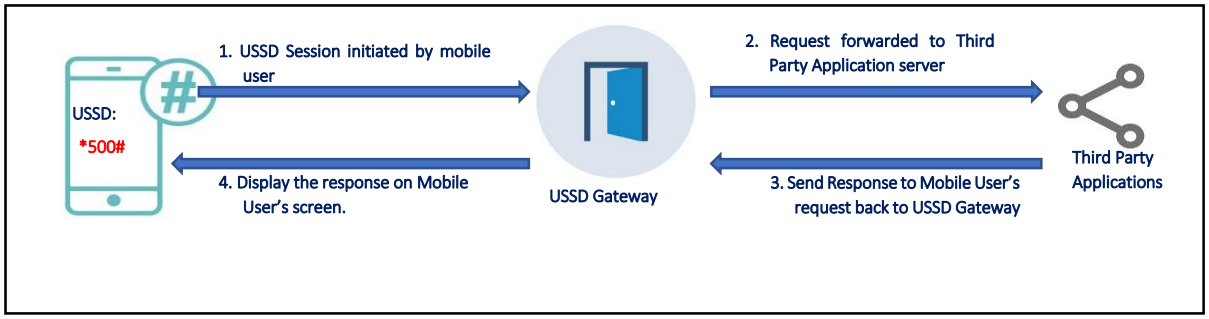
The study has considered regulatory provisions implemented by countries with successful USSD implementation for financial services. Furthermore, this study has assessed the prospects of USSD-based payments in Nepal and has suggested appropriate policies to promote USSD for mobile financial services in Nepal. The study has also highlighted the need for

coordination among NRB, Nepal Telecommunication Authority (NTA), and USSD service providers for financial inclusion in the country.

2. Technical Architecture and Working Mechanism

The technical architecture of USSD channel is presented in Figure 1. The central infrastructure for the USSD system is the USSD gateway, which is mostly owned and managed by MNOs. All requests are processed through the USSD gateway. MPOs/PSPs willing to avail USSD channel for offering mobile financial services should integrate their systems with the USSD gateway to process USSD requests through the MNOs' telecommunication network. Different telecom operators may have different USSD gateways, the access to which is generally standardized using the same USSD code for mobile financial services. For instance, UPI uses *99# as the USSD code for all telecom operators in India (NPCI, 2024; Government of India, 2023)

Figure 1: Technical Architecture of USSD Channel



Source: Friday, Abduirasaq & Mary (2023)

The general working mechanism of USSD requests is based on the following steps:

Step 1: A request is made through the cellphone/ mobile phone to the MNO or telecom service provider (for instance: Nepal Telecom).

Step 2: The USSD gateway at the MNO sends the request to the third party USSD application, where there are business logics determining the menu to serve the users on receiving users' request (for instance: NamastePay Application Server to process USSD payments)

Step 3: The USSD application (for instance: NamastePay Application Server) responds to users' requests and sends the response back to the USSD Gateway.

Step 4: The USSD Gateway displays the response on the screen of users.

3. Key Success Factors for USSD-based Payment System

The USSD channel for mobile financial services bears offline capability, allowing basic financial services to be availed through telecommunication connectivity (even if poor), without the need for internet connectivity. The USSD and STK channel marked the era of mobile-based financial services when the outreach of internet was limited and costly. However, as high-quality internet became accessible at a lower cost, API and app-based mobile financial services have been introduced in addition to the USSD channel for delivering digital financial services. Mobile applications offer an interactive user interface/experience (UI/UX) to customers and have the capability to offer a wide range of financial services, which are limited in the USSD channel.

In India, there were 185 million smartphone users in mid-2015, and an additional half billion connections were expected by 2020 (TRAI, 2016). In this light, mobile financial applications were already popular. Consequently, financial service providers may not have prioritized USSD as a channel for access with the growing low-cost mobile broadband and 5G technology (TRAI, 2016). Nonetheless, USSD is still one of the most preferred channels for offering digital financial services worldwide. The key factors responsible for the success of the USSD channel for mobile financial services are as follows:

- When USSD-based payment is the main payment system with no other alternatives, the success rate of USSD-based mobile financial services increases. This has been the case in Kenya, where M-Pesa, owned by the telecom operator Safaricom, started the STK-based mobile financial services in 2007. The USSD channel was also added in M-Pesa. M-Pesa is still the most widely used digital financial service in Kenya. In May 2023, M-Pesa contributed to 84 percent of financial inclusion, directly impacting 32.6 million individuals and more than 3 million businesses (Safaricom PLC, 2023).
- If the telecommunication authority/ regulator mandates every telecom operator to allow USSD gateways for banking and digital financial services, the adoption of USSD channels can increase for mobile financial services. For instance, TRAI in India has mandated all MNOs to provide the USSD channel for mobile financial services (Government of India, 2023).
- The USSD channel for mobile financial services can succeed if it can be accessed with a uniform customer experience. NPCI has used *99# as the common USSD code which is used by all telecom operators to offer USSD-based mobile financial services (NPCI, 2024; Government of India, 2023). Thus, an interoperable USSD network, enabled on

telecommunication side, a common USSD code, and a common gateway can greatly enhance the success rate of USSD-based payment systems (SBP, 2019).

- The success of the USSD channel also depends on the development of user-friendly menus, increasing customer awareness, and developing a unified USSD platform (SBP, 2019).
- The USSD channel for mobile financial services can be successful if it provides a proper encryption mechanism to protect the integrity of the financial information within its environment by an auditable process (Central Bank of Nigeria, 2018).
- The USSD channel must ensure, at least, radio encryption between users' SIM-enabled device and base stations to provide secured USSD sessions (Central Bank of Nigeria, 2018).
- The USSD channel must ensure the secure transmission of USSD signals between network operators and USSD aggregators, and between USSD aggregators and banks (Akinrinwa, 2021).
- The USSD channel should provide a proper message authentication mechanism to validate that requests/responses are generated through authenticated users. Such authentication mechanisms shall include a minimum combination of any of International Mobile Subscriber Identity (IMSI), Date of SIM Swaps, Date of Mobile Station International Subscriber Directory Number (MISSDN) Recycle, International Mobile Equipment Identity (IMEI), Date of Device change, and others. (Central Bank of Nigeria, 2018)
- The USSD channel for mobile financial services must assure notification to customers on the status of every transaction conducted through the channel (Central Bank of Nigeria, 2018).
- For the USSD channel to succeed in providing secure mobile financial services, USSD services should not relay details of other electronic banking channels to prevent the compromise of other electronic banking channels through the USSD channel (Akinrinwa, 2021).
- Regulations should enforce a limit on the amount of allowed transactions through the USSD channel. In Nigeria, there is a transaction limit of NGN 100,000.00 per customer, per day. However, customers desirous of higher limits shall execute documented indemnities with their banks or mobile money operators (Central Bank of Nigeria, 2018).

- The regulator should mandate two factor authentication (2FA) but the 2FA should be displayed in the USSD menu itself and not in the GSM number of customers (Central Bank of Nigeria, 2018).
- For enhancing the utilization of the USSD channel for mobile financial services, implementation of behavioral monitoring system to detect SIM-Swap/ Churn status, user location, unusual transactions at weekends, etc. can greatly help MPOs/PSPs to better strategize to increase the usage of USSD channel (Central Bank of Nigeria, 2018).
- The success of any payment system, alike the USSD channel, depends on a clear dispute resolution mechanism with a clear demarcation of roles for BFIs, MNOs, and USSD aggregators. The turnaround time (TAT) for dispute resolutions should also be clearly laid out.

4. Policy Objectives for USSD-based Payment System

The major policy objectives related to the USSD-based payment system are as follows:

- To ensure financial inclusion by enabling feature phone holders to use digital financial services.[9]
- To leverage the infrastructure, customer base, and agent network of telecommunication companies for expanding digital payment modes among the unserved and marginalized segment of population.[10]
- To ensure a common communication standard for financial transactions through the USSD channel (SBP, 2019; Government of India, 2023).

5. Benefits from USSD-based Payment System

The benefits from USSD-based payment system are explained as below:

- It provides improved access to digital financial services for the unbanked population.
- It enables the possibility of providing merchant payments and easy credit facilities to people, especially in the rural and marginalized settings.

[9] The Retail Payment Strategy, 2019 has stated in the Section: Deepening digital retail payment systems that USSD payments would be made available as a standard feature for all transaction account holders by their respective licensed banks/ PSOs/PSPs, along with other digital retail payment modes such as debit cards. This would result in enabling the large number of feature phone holders in Nepal to make use of digital payment modes.
[10] CGAP (2014)

- Government-to-person (G2P) payments to people[11] can be eased using the USSD channel via feature phones, especially in rural areas.
- The USSD-based payment system is an alternative to existing person-to-person (P2P) payment systems for areas where internet connectivity is not available or is poor.
- It is a more secured alternative than SMS and IVR banking for offering mobile financial services. The advantages of USSD over SMS and IVR channels are presented in Box 2.

Box 2: Comparison of USSD, SMS and IVR Channels for Offering Mobile Financial Services

Particulars	USSD	SMS	IVR
External Interception	It operates within a closed network environment, with less chances of external interception.	SMS is generally a plain text, which can be intercepted through mediums, such as SIM swapping, malware and phishing attacks.	IVR is prone to interceptions through social engineering attacks.
Real-time Interaction	It requires real time user participation when the USSD session is active.	SMS is a passive mode in which real time interaction is not needed. A response to the SMS can be provided after a time gap, which makes this channel susceptible to external interceptions.	It requires real-time user participation during an active IVR session.
Authentication Challenges	The authentication can be done using PIN code and other personal details that are known to specific user.	Anyone who has intercepted the SMS can take the financial benefit. Thus, there are authentication challenges in SMS channel, if the cellphone is compromised.	IVR systems may not actively use voice recognition or struggle to use voice recognition for customer identification.

Source: Presentation by NDPC to PSD, NRB, Kartik, 2080

- The USSD channel supports multiple languages to spur financial inclusion initiatives. For instance, UPI *99# is offered in 13 different regional languages, aiming for rural inclusion (Government of India, 2023).

[11] In FY 2022/23, total eligible population for social security allowances (SSAs) stood at 3,629,921, that is 12.45 percent of total population (Unicef, 2023). The detailed breakdown of the eligible population for different social security allowances are as below:

SSAs	Old age	Old age (Dalit+Karnali)	Single Women	Widows	Endangered Ethnic Tribe	Disability (Full)	Disability (Partial)	Child Grant (Dalit)	Child Grant (25 Districts)	Total
Total Beneficiaries	1,565,191	167,206	211,000	358,890	22,144	63,954	132,710	351,890	756,936	**3,629,921**

- USSD works on the vast majority of phones, and it does not require changes to the SIM or a new SIM (either of which can be complex and often costly steps).[12]

6. Challenges of USSD-based Payment System

USSD is one of the earliest technologies for offering mobile financial services[13]. Over the years, as broadband connectivity and smartphone penetrations have surged, people have started to opt for app-based financial services instead of the USSD, SMS, or IVR channel. The USSD channel has some challenges and limitations, which have given rise to the use of online payment systems. Some of such challenges are as below:

- USSD allows only limited characters (182 alphanumeric characters per page[14]) to be used in menus. As a result, the USSD channel is less interactive than mobile apps that allow rich texts, pictures, etc.
- The USSD channel has a limited scope of interoperability with other payment systems and digital marketplaces.
- The USSD channel offers limited UI/UX to customers.
- The USSD channel is dependent on telecommunication network. Poor network connectivity (especially in difficult terrains) may increase session dropout rate, limiting the use of the USSD channel for availing mobile financial services.
- A high dropout rate of USSD sessions can potentially raise costs of session retrials and harm customer trust.[15]
- USSD-based payment systems are subject to regulations from multiple authorities (financial, telecommunication, and competition regulator). Thus, coordination and harmonization of multiple regulations are major challenges for using the USSD channel for mobile financial services.
- Due to technical limitations (related to allowed characters, UI/UX, network dependency, etc.), the USSD channel has a limited possibility of scalability.
- People require some level of literacy and awareness to operate USSD menus. Hence, rural areas, where there is lack of rudimentary education, creating understanding of understanding USSD menus can be a challenge.

[12] CGAP (2015)
[13] In 1983, European Union started debate on digital cellular voice communication standard, which was settled on 1987. In 1988, European Telecommunications Standards Institute was established which released GSM 02.90. In 2000, most African companies adopted the GSM technology. Finally, in 2007 Safaricom launched M-Pesa in Kenya based on STK technology. The success of M-Pesa in Kenya led to the emergence of M-Pesa in Tanzania in 2008, implemented by Vodacom- an affiliate company of Safaricom- based on USSD technology instead of STKs. This was the onset of USSD-based payment system from Africa. The USSD channel was replicated for financial services in Nigeria by GTBank and Fidelity Bank in 2014 (Bolarinwa, 2022).
[14] (Mallik, Tran, & Twagirumukiza, 2020)
[15] CGAP (2015)

- The capital expenditure (CAPEX) and operational expenditures of MNOs for the USSD gateway are high. Consequently, the USSD access fee is generally high.

7. USSD-Based Payment Systems and Regulatory Regime

7.1 Global Implementation of USSD-based Payment System

The successful stories of USSD implementation include bKash in Bangladesh, WingPay in Cambodia, EasyPaisa in Pakistan, M-Pesa in Kenya and Tanzania, EcoCash in Zimbabwe, UPI *99# in India, among others. The key insights of such implementations are presented in Table 1.

Table 1: Global Implementation of USSD-based Payment Systems

USSD-based Payment Systems	Country	Remarks
M-Pesa	Kenya	1. Launched in 2007 2. Services: • Checking balance • Depositing cash into bank account • Sending money to mobile numbers • Withdrawing funds from M-Pesa agents • Getting M-Pesa statement on email • Making utility payments • Making merchant payments 3. Responsible for 84% financial inclusion in Kenya in 2023, impacting 32.6 million customers through all mediums STK, Super App, Safaricom App, USSD, and Automated Teller Machine (ATM)
BKash	Bangladesh	1. Launched in 2011 2. Allows 98 percent of Bangladesh's mobile users to access its service via very basic handsets. 3. Services: • Sending money • Making mobile top-up/ recharge • Making payments

		• ATM Cash out • Remittance
EasyPaisa	Pakistan	1. Launched in 2009 2. *786# as USSD Code for Telenor and *2262# for Ufone, Zong, and Jazz Customers 3. Services: • Mobile Top-up • Bill Payments • Send Money • Check Account Balance • View mini statements • Manage mobile wallet • Cash deposit and withdrawal • Buy airtime • Money transfer to any Computerized National Identity Card (CNIC) • Donations
Tigo Pesa	Tanzania	1. Lunched in 2014 2. Services: • Sending money to any network • Sending money as voucher • Cash out • Bill payments • Self-top up and buying packages • e-Statement Generation • Check Balance • Store and manage favorites • International Money Transfer • Link Visa Card • Google Play Payment • Airtime/ Package Loan (Lend me Service)

EcoCash	Zimbabwe	1. Launched in 2011 2. *151# as USSD code 3. Services: • Balance Inquiry • Airtime purchase • Send money • Cash out • Bank to wallet transfers • Bill payments • Merchant payments
Wing Pay	Cambodia	1. Launched in 2018 2. *989# as the common USSD code 3. Services: • Save money • Make merchant payments • Transfer fund to Wing and non-Wing users, etc. 4. Wing account are not tied up with mobile number
UPI *99#	India	1. Launched in 2014 as *99# (USSD 1.0) and UPI *99# (USSD 2.0) launched in 2016 2. A common USSD code *99# used by all MNOs. 3. Available in 13 regional languages 4. Financial Services: • Sending money using mobile number • Sending money using UPI ID • Sending money using account number + IFSC • Requesting money using UPI ID/ mobile number 5. Non-Financial Services: • Checking account balance • Setting up UPI PIN • Changing UPI PIN • Viewing last 5 transactions' statement

NamastePay *500#	Nepal	1. Launched in 2021 2. Services: • Viewing account details • Checking account balance • Making recharge/ cellphone top-up • Adding money in NamastePay wallet • Sending money to others • Making utility bill payments • Raising help and support

Source: Respective websites

7.2 Regulatory Regime for USSD-based Payment System

The underlying infrastructure of the USSD channel (USSD gateway) is generally owned by MNOs. In jurisdictions that allow MNOs to directly operate mobile financial services, MNOs may create access problems for other MNOs, banks, and financial service providers that do not own the required infrastructure. These access issues could take the form of complete denial of access to infrastructure or providing access at a high price or with a degraded quality. Such access issues may be created to wipe out competition from potential MPOs/PSPs. Since MNOs and MPOs/PSPs are regulated by separate authorities, coordination between regulators is important to tackle the possibility of anti-competitive behavior given the differences in approaches of regulators (CGAP, 2015). A joint committee or a forum incorporating representatives from financial, telecommunication, and competition regulators can greatly serve such a purpose. The USSD-related regulations should primarily focus on managing the following issues:

- Denial of USSD access, high access price, or degradation of the quality of USSD sessions by MNOs.
- MPOs/PSPs passing on the cost of session dropouts to customers, making USSD services expensive for end users.
- MNOs undertaking inequitable treatment by giving access preference only to banks and entities that are in partnership with the MNO owning the USSD gateway.
- Failure of MPOs/PSPs to cope with competition created by big institutions (MNOs) and subsequent closure of potential MPOs/PSPs.

The aforementioned issues have been evident in countries that have implemented USSD-based payment systems. In Pakistan, it was reported that MNOs were willing to provide access only

to their partner microfinance banks, which were effectively the part of the same corporate group. In Nigeria, Kenya, and Bangladesh, there were complaints that MNOs were providing USSD gateway access but at a very high price (CGAP, 2015).

Thus, a coordinated regulatory regime, harmonizing the efforts of telecommunication, financial, and competition regulators of the nation, is needed to successfully implement USSD for mobile financial services. Considering the aforementioned issues and the key success factors for USSD-based payment systems, the following regulatory interventions can greatly help in promoting USSD for mobile financial services (CGAP, 2015):

- Regulators should promote commercial agreements to emerge between MNOs and third parties for the provision of USSD to advance competition and the development of the digital financial services market without placing restrictions on MNOs. For this, regulators may opt for moral suasion approach, communicating a preference for MNOs to provide USSD access. The Central Banks in Kenya and South Africa have communicated preferences for other competition-sensitive issues, namely, interoperability in retail payments. Commercial arrangements such as revenue share, bilateral arrangements, customer charges, or a mix of these should be allowed to play out evenly in the market. Flexibility to determine the appropriate commercial arrangements is essential to build a competitive market for access to the USSD channel where providers and consumers that see value in the channel can leverage it to expand outreach of financial services while providing MPOs/PSPs with the revenue to maintain the channel.
- Regulators should ensure a coordinated ***Dispute Resolution Mechanism*** whereby the telecommunication and financial regulator (and potentially the competition regulator) jointly intervene to resolve access, price, and/or quality issues. This could give the MNOs the opportunity to explain arguments for withholding access, including the potential impact that the provision of USSD at scale could have on an MNO's core telecommunications business. For example, the regulators in Bangladesh have formed a consultative USSD committee, including representatives from Bangladesh Bank, the telecommunications regulator, the telecommunication association, and multiple banks.
- Regulator should consider introducing minimum quality standards for USSD services, specifying the maximum percentage of sessions that can be dropped before fines or other penalties are handed out. The Rwanda Utilities Regulatory Agency (RURA) has introduced similar regulations for voice, capping the dropped call rate at 2 percent per

quarter (RURA 2013). However, a challenge of such a regulation would be to isolate the cause of the dropped USSD session. It could be due to under-investment or selective degradation of quality by the MNO.

- Price regulation based on detailed cost considerations can be complex, time consuming to monitor, and extremely difficult to get optimal price. However, the price regulation that USSD prices are applied in a non-discriminatory fashion, including the MNOs' own downstream mobile financial service provider or partner bank may be appropriate. Preuvian regulators have taken this approach requiring the MNO to create a separate entity to provide mobile payments, which provides an opportunity to more easily identify discriminatory USSD pricing[16].
- Commercial model neutrality, i.e. flexibility to choose and deploy commercial models in the model, is fundamental to a market or service that is still in an infant stage. Such provision helps to identify the best possible sustainable business model in medium to long term.
- A regulatory intervention that sets a ceiling price on access to the USSD channel and the modality for such price to be charged (i.e. to the end customer of the operator only).

In India, Telecom Regulatory Authority of India (TRAI) has specified the following regulatory provisions related to USSD for mobile financial services (TRAI, 2016; TRAI, 2022):

- All telecom operators need to be live with the USSD service to ensure maximum reach and adoption, and the cost of this service should not be added onto National Payments Corporations of India (NPCI) as it is already bearing the cost of SMS and PSP fee on the Bharat Interface for Money (BHIM) app extended to banks and users.
- Telecom operators are also directed to promote the USSD service via flash messages and communications to increase public awareness levels.
- TRAI through the Telecommunication Tariff (Sixty Sixth Amendment) Order, 2021: Amended Section 8.a of the Telecommunication Tariff Order, 1999 by making charge for outgoing USSD session for USSD-based mobile banking and payment services Nil.

[16] CPMI (2015)

8. Prospects of USSD-based Payment System in Nepal

8.1 Digital Payments Landscape in Nepal

Nepal is emerging rapidly in terms of digital payments since the establishment of PSD at NRB in 2015. PSD regulates and supervises payment related institutions- Payment System Operators (PSOs) and PSPs.

Digital payments have surged in Nepal, especially in city areas. The Covid 19 pandemic fueled the growth of non-cash payments from 2020 and the wave continues till date. The user base of e-wallets increased from 6.27 million in mid-August 2020 to 18.94 million in mid-July 2023. The number of *connect*IPS users increased from 0.16 million in mid-August, 2020 to 1.10 million in mid-July 2023. Similarly,mobile banking users have significantly increased by 16.7 percent in 2022/23, reaching 21.36 million (NRB, 2023).

Some of the key contributors to this growth of digital payments in Nepal are as follows:

1. Increased Internet and Broadband Connectivity

Nepal has expanded its digital foundation by enabling internet connectivity even in rural areas of the nation. The 4G/LTE services have been expanded to 739 of 753 local levels across 77 districts of Nepal[17]. Similarly, the broadband internet service has penetrated 137.68 percent of the total population of Nepal, with mobile broadband covering 69.22 percent of the total broadband market (NTA, 2023). Such an increase in the use of internet and broadband services has led to a surge in the use of online payment systems.

2. Increased Smartphone Penetration Rate

The smartphone penetration rate stands at 72.94 percent of the total households in Nepal. Nonetheless, the population using ordinary mobile phones is also high (73.15 percent)[18]. This shows dual ownership of ordinary mobile phone and smartphones by many households. The greater outreach of smartphones has created opportunities for financial inclusion through digitalization, especially in rural areas, where the ordinary mobile phones penetration rate (25.86 percent) is higher than that of smartphones (20.38 percent).

[17] See. NTA (2023)
[18] See. NSO (2021)

Table 2: Mobile Phone (Ordinary and Smartphone) Penetration Rate in Nepal

Particulars	Total Households	Households with		Penetration Rate (%) of	
		Ordinary Mobile	Smartphone	Ordinary Mobile	Smartphone
Nepal	**6,666,937**	**4,876,561**	**4,862,885**	**73.15**	**72.94**
Municipality Wise:					
Urban		3,152,746	3,503,879	47.29	52.56
Rural		1,723,815	1,359,006	**25.86**	20.38
Ecological Belt Wise:					
Mountain		335,532	219,404	5.03	3.29
Hill		2,157,769	2,179,999	32.37	32.70
Terai		2,383,260	2,463,482	35.75	36.95
Province Wise:					
Koshi		864,107	883,723	12.96	13.26
Madhesh		864,700	773,084	12.97	11.60
Bagmati		1,068,668	1,254,709	16.03	18.82
Gandaki		470,559	514,690	7.06	7.72
Lumbini		851,402	861,496	12.77	12.92
Karnali		301,010	213,749	4.51	3.21
Sudur Paschim		456,115	361,434	6.84	5.42

Source: NSO (2021)

3. Reduced Cost of Connectivity

With the growing use of mobile broadband services, the cost of internet connectivity has reduced significantly over the years in Nepal. In 2023, the per GB cost of connectivity for Nepal stands at USD 0.43, which was as high as USD 2.25 in 2019[19]. As internet becomes affordable, its use for digital financial services is also increasing. Consequently, financial service providers are innovating digital financial services that can be accessed through internet.

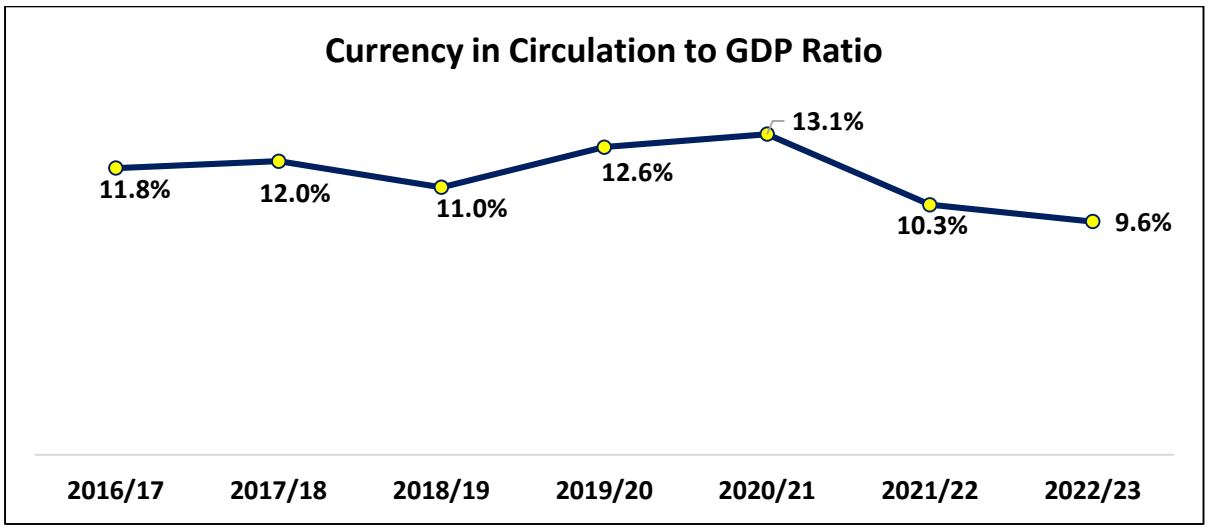
4. Behavioral Shift and Decreased Currency in Circulation-to-GDP Ratio

In last two fiscal years, after the Covid 19 pandemic, there has been a decrease in currency in circulation-to-GDP ratio. The currency in circulation has been used as the indicator of physical cash in the economy. The ratio peaked during the Covid 19 pandemic, despite widespread use

[19] See. https://www.cable.co.uk/mobiles/worldwide-data-pricing/

of digital payments[20]. However, as the pandemic subsided, the behavioral shift from cash to non-cash payments has remained as a new normal.

Figure 2: Currency in Circulation to GDP Ratio



Source: Calculated using data from NRB (2023)

Consequently, as shown in Figure 2, the currency in circulation-to-GDP ratio has decreased to 9.6 percent in 2022/23, compared to 13.1 percent in 2020/21 and 10.3% in 2021/22. Such a decrease hints the surge in non-cash (digital) transactions in the economy.

Furthermore, the Government of Nepal (GON) has also extensively used digital channels for making expenses and receiving revenues. As shown in Table 3, the value of government expenditure through NCHL-based systems has increased rapidly from 15.58 percent in 2018/19 to 76.26 percent in 2022/23. Similarly, there has been a gradual improvement in the collection of government revenue through NCHL-based systems. Digital revenue collection has increased from 0.05 percent in 2018/19 to 24.19 percent in 2022/23 through using NCHL-based systems.

[20] A similar trend was observed in India. While digital payments have surged at a compounded annual growth rate (CAGR) of 51 percent and 27 percent in volume and value terms between 2016/17 and 2022/23, the currency in circulation-to-GDP ratio also grew by 14.4 percent in 2020/21. Owing to the perceived substitutability between digital payments and cash, the simultaneous growth in both seems counterintuitive, giving rise to a **"currency demand paradox"**. Such a growth in currency demand is found to have been influenced by the precautionary and store-of-value motives, while the use of cash as a payment medium continues to fall (Awasthy, Misra, & Dhal, 2022).

Table 3:Digital Transactions of the Government of Nepal Processed through NCHL Systems

GON Digital Transactions	2018/19	2019/20	2020/21	2021/22	2022/23
Expenses (Volume)	429,399	721,550	5,903,298	9,430,365	10,478,637
Revenue (Volume)	47,881	104,823	464,316	1,607,200	2,132,723
Expenses (Value in Rs. Billion)	166.33	219.06	669.78	866.32	1,090
Revenue (Value in Rs. Billion)	0.4	3	12	133	233.41
% of Expenses (in value) made through NCHL Systems[21]	15.58	20.02	56.71	66.84	76.26
% of Revenue (in value) collected through NCHL Systems[21]	0.05	0.38	1.28	12.45	24.19

Source: Nepal Clearing House Limited (NCHL) and NRB

8.2 USSD-based Payment System in Nepal

The NRB issued the PSP license to Nepal Digital Payments Company (NDPC) Limited on March 16, 2021 to implement USSD-based mobile financial services in Nepal. NDPC has been established with key stake of Nepal Telecom and Rastriya Banijya Bank Limited. NDPC launched the NamastePay *500# USSD service for its NamastePay wallet from September 14, 2021, with basic features such as user registration, mobile top-up, and P2P transfer.

On April 4, 2022, NDPC implemented additional features like loading NamastePay wallet and withdrawing funds through linked bank account. Furthermore, on February 1, 2023, NDPC launched additional features like viewing one's own account details, checking balances, and making utility bill payments. Today, the average monthly active users of NamastePay transacting through USSD channel stand at 19,580. The USSD channel is mostly used for mobile recharge/ Top-up service, with an average top-up ticket size of Rs. 62.51.

NDPC is now exploring additional business opportunities in providing credit facilities, government payments and aid distribution, among others through the USSD channel.

[21] The percentage of digital expense and revenue have been calculated considering total expense and revenue figures stated in the current macroeconomic and financial situation 2018/19 to 2022/23

Total GON Transactions	2018/19	2019/20	2020/21	2021/22	2022/23
Total Expenses	1,067.3	1,094.3	1,181.0	1,296.2	1,429.3
Total Revenue	871.8	793.8	938.3	1,068.0	964.9

Value in Rs. Billion

8.2.1 Opportunities for USSD-based Payment System in Nepal

Although the USSD channel of NDPC is yet to take pace, the opportunities exist for USSD for mobile financial services in Nepal. Such opportunities are analyzed below:

1. National Cyber Security Index (NCSI) and Cyber Risks

Nepal ranks at 109th position with an NCSI index of 28.57, but the digital development level (DDL) is higher than NCSI (30.58)[22]. This suggests cybersecurity lags behind the digital development in Nepal. USSD is a closed session-based interaction between the financial service provider and customers, making it highly secure from interceptions. Therefore, the USSD channel can enhance the DDL by providing digital payments solutions to a greater segment of the population. Since USSD is a secured medium, it can also have a positive impact on Nepal's NCSI. In this regard, a USSD-based payment system has the opportunity to improve both digital payments and cybersecurity index in Nepal.

2. Feature Phone Users

A large chunk of the Nepalese population (73.15 percent) owns a feature phone[23]. Moreover, the ownership rate of feature phones in rural municipalities (25.86 percent) is higher than that in urban municipalities (20.38 percent). This provides opportunities for financial service providers to penetrate rural areas with a USSD-based payment system, targeting the feature phone users.

3. Large unbanked adult population in rural area

Opportunities exist for digital innovators in Nepal as 50 percent of adults from rural area and 40 percent of adults from urban area still lack an account at a financial institution. Furthermore, the feature phone ownership rate is higher than that of smartphones in rural municipalities and provinces: Madhesh (12.97 percent feature phone penetration and 11.60 percent smartphone penetration), Karnali, (4.51 percent feature phone penetration and 3.21 percent smartphone penetration) and Sudur Paschim (6.84 percent feature phone penetration and 5.42 percent smartphone penetration)[24]. This provides opportunities to increase financial inclusion by targeting feature phone users in rural municipalities and select provinces with a USSD-based payment system.

[22] (eGA, 2023)
[23] (NSO, 2021)
[24] See. Table 1

4. Alternative Payment System

As the USSD-based payment system can be used without internet connectivity, it serves as an alternative payment system to existing app-based online payment systems (mobile banking, internet banking, e-wallets, and other fast payment systems). Nepal has challenging topography, with around 83 percent of total land covered by mountainous and hilly areas[25]. The quality of network and internet connectivity is poor in such areas. The USSD-based payment system can be a great alternative in areas where internet connectivity is poor or unavailable for financial access and payment services.

As an alternative to existing payment systems, USSD can benefit customers in the following ways:

- Providing easy mobile phone topup/ recharge service using the USSD channel when the customer runs out of balance and lacks internet connectivity,
- Offering access to digital financial services in areas where there is no or poor internet connectivity. Additionally, the USSD channel works efficiently in areas where the telecom network connectivity is poor for voice telephony,
- Enabling possible access to G2P payments (such as pensions and other government transfer payments) through the USSD channel to elderly people and others who are accustomed to feature phones, etc.

8.2.2 Challenges for USSD-based Payment System in Nepal

Although USSD for telecom services has been in operation for a long time, USSD for mobile financial services started in Nepal from 2021. However, the uptrend in app-based financial systems like eSewa wallet (commenced in 2010), mobile banking applications (commenced from 2012), Inter-bank payment system (IPS) (launched in 2016), *connect*IPS (launched in 2018), and others began well before 2021.

Countries successfully operating USSD-based payment system (like Kenya and Tanzania) began with the STK and USSD channel as there was no other alternative when such a system began. As technology became accessible, financial services providers started innovating through web, and app-based channels. In Nepal, the trajectory of digital payments has been different. Nepal started with app-based online payment systems that offer sophisticated UI/UX

[25] See. https://ntb.gov.np/en/plan-your-trip/about-nepal/geography

valued by customers. In this light, the adoption of USSD channel, which has its underlying limitations, is constrained by certain challenges. Some of such challenges are as follows:

1. Behavioral Aspects Related to Digital Payments

The Nepalese payment system is dominated by app-based (online) payment systems like mobile banking, internet banking, e-wallets, Quick Response (QR) Code among others. Moreover, the use of smartphones has significantly replaced web platforms like internet banking with mobile banking, primarily due to ubiquity and easy mobility of mobile phones. In 2021/22, transactions from mobile banking increased by 62.21 percent, compared to 2020/21, while transactions from internet banking increased only by 5 percent. Similarly, in 2022/23, transactions from mobile banking increased by 56.12 percent, while transactions from internet banking decreased by 4.15 percent[26].

Similarly, as customers are extensively using app-based systems that have intuitive UI/UX, USSD may not be easily adopted as the primary payment channel. This is also evident through the lower adoption of NDPC's USSD-based mobile financial in Nepal. Nonetheless, the USSD channel can serve as an alternate channel in cases when app-based online payment systems cannot be accessed. Thus, with proper user awareness, the USSD channel can further intensify access to and usage of the primary payment channel of financial service providers.

2. Costly Investment

Based on the current adoption trend of payment systems in Nepal, USSD-based payments can be an alternative to app-based online payment systems. However, if the session dropout rates are not controlled, customers may be liable for higher transaction fees. For financial service providers too, adding USSD as a channel by bearing the CAPEX and operational costs may not be justifiable, as people have already adopted innovative app-based payment systems. This has been the case in India too. During mid-2015, when USSD-based payments gained momentum, mobile financial applications were already popular in India, making USSD the least preferred channel for financial service providers. Hence, financial service providers may not be motivated to make costly investment in offering USSD as a standard service.

3. User Awareness

USSD menus are generally complex as the options used to navigate menus are complicated. Many times, session dropouts may occur while figuring out the menus. In absence of proper user education, the attrition rate of users may be high, owing to complex menus. Thus, creating

[26] (NRB, 2023)

appropriate user awareness considering the geography, administrative construct, and literacy level of customers is a challenge. Furthermore, if the menus are not contextualized using local languages and dialects, the acceptance of USSD channel for mobile financial services may be low.

In addition to the above mentioned challenges, all other challenges outlined in Section 1.5 of this report are equally pressing in the context of Nepal. Hence, all these challenges should be considered while deciding on the implementation of USSD as a channel for mobile financial services.

9. Conclusion and Recommendations

A guiding principle for regulation is that it should be the least restrictive to achieve the intended objective (financial inclusion, increased competition, and consumer benefit) and should be proportionate to the extent of risk (CGAP, 2015). Moreover, commercial model neutrality is equally important in a market that is still developing, so that the market is able to identify the best possible sustainable business model in medium to long term. Thus, mandating all licensed banks/ PSOs/PSPs to make USSD payments a standard feature, as stated in the Retail Payment Strategy, 2019, may not be suitable for an evolving market like Nepal. Those payment-related entities that see value in introducing USSD payments as a standard feature should be allowed to implement the USSD channel, and those institutions that need to bear additional CAPEX and/or operational costs should not be forced to offer USSD payments to customers.

As the USSD channel can be an alternative for app-based online systems, the regulators should intervene with appropriate policies to ease the implementation of USSD-based payment systems. In this regard, the regulation/policies/ strategies specified in Figure 3 may be relevant in the context of Nepal.

Role of NTA:

- The telecommunication authority/regulator, NTA, should mandate all MNOs to provide USSD for mobile financial services. To ensure uniform customer experience, the authority should explore the possibility of mandating all MNOs to implement a common USSD code for mobile financial services.
- NTA should issue regulation to MNOs to ensure equitable access to the USSD gateway for all MPOs/PSPs/BFIs (and not just for partner BFIs/ PSOs/PSPs), without

discriminatory pricing. In this light, NTA should regulate the pricing for accessing the USSD gateway.

- NTA should further issue regulation giving preference to interoperability of USSD gateways to ensure interoperability of payment systems.

Role of NRB:

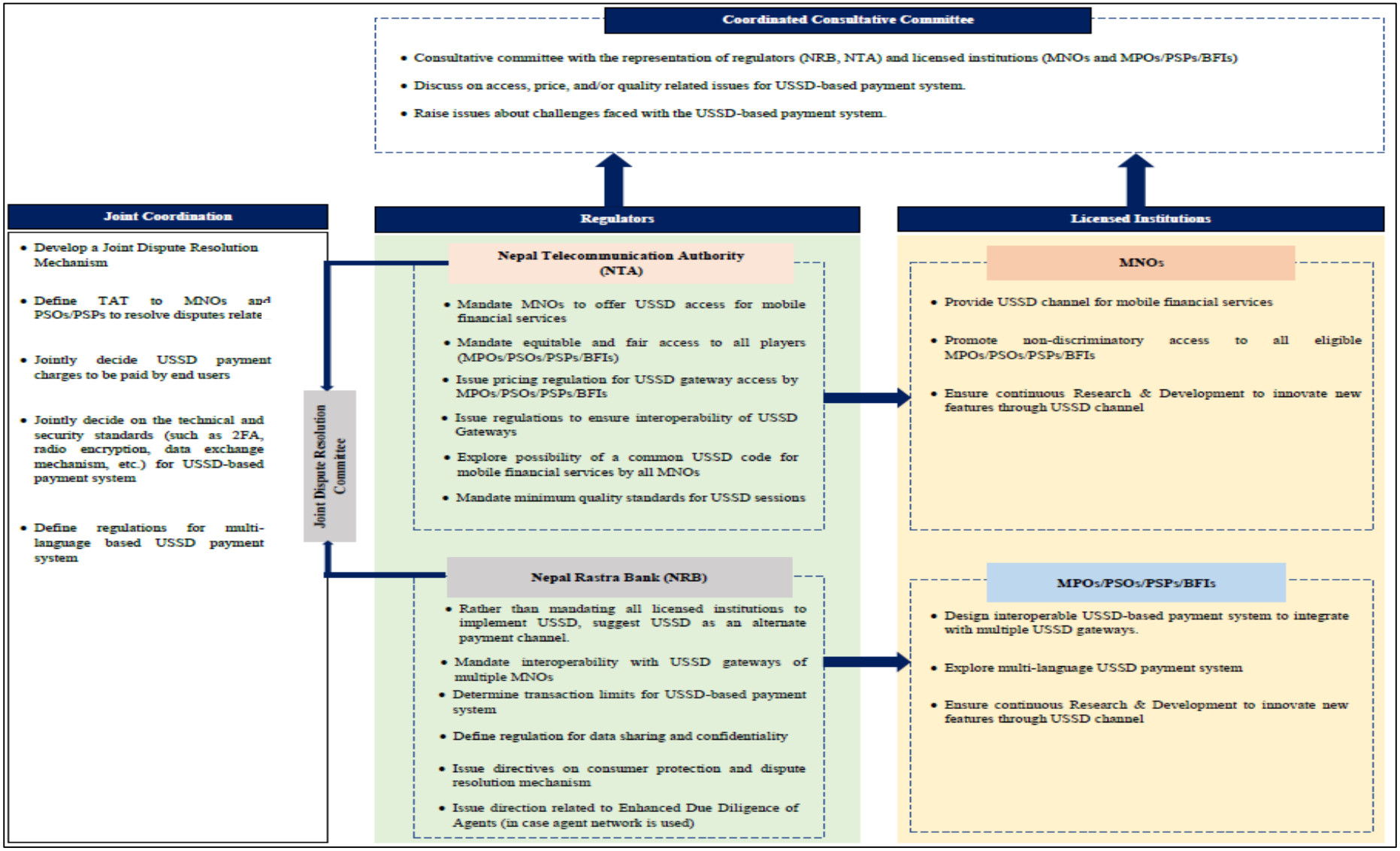
- The financial regulator (NRB) should not mandate licensed banks/ PSOs/PSPs to offer the USSD-based payment as a standard feature. Rather, payment related institutions should be allowed to implement USSD for mobile financial services as an alternative to innovative mobile financial applications by considering their capital and operating expenditures.
- The licensed institutions using the USSD-based payment channel should be mandated to make their system interoperable with USSD gateways of all MNOs.
- NRB should specify transaction limits for the USSD-based payment system, considering the risks and limitations of the channel.
- In case the PSPs use agent network to expand their USSD-based payment system, NRB should direct the PSPs to conduct Enhanced Due Diligence (EDD) of the agents.
- NRB should specify data sharing and confidentiality directives to ensure the USSD channel does not compromise the information of other connected systems.
- NRB should also specify consumer protection-related directions, highlighting aspects such as dispute resolution mechanism, TAT, etc. that are jointly defined by NTA and NRB.

Joint Responsibilities of NRB and NTA:

- The regulators and other stakeholders (NTA, NRB, Banks and Financial Institutions, PSOs/PSPs) should develop a ***Coordinated Consultative Committee*** to jointly decide on access, price, and/or quality related issues for the USSD- based payment system.
- NRB and NTA should develop a ***Joint Dispute Resolution Mechanism*** to determine roles and responsibilities of regulators and licensed institutions to ensure timely resolution of disputes. There should be a definite TAT for MNOs//PSPs/BFIs for resolving disputes related to USSD payments.
- NTA should introduce a minimum quality standard for USSD services to control session drop rates.

- NRB and NTA should jointly decide USSD payment charges for end users such that the charges are low and can motivate users to use this channel for making payments.
- NRB and NTA should jointly decide on the technical and security standards (as specified in Section 1.2) to ensure that the channel fulfills cyber security requirements.
- NRB and NTA should direct both PSOs/PSPs and MNOs to develop their systems to support multiple languages for USSD channel for mobile financial services.

Figure 3: Proposed Implementation Modality for USSD-based Payment System in Nepal



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