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The Development of National Payment Systems: Lessons Learned from Developing Country Payment Systems

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The Development of National Payment Systems: Lessons Learned from Developing Country Payment Systems

Ajmal Ahmady
Harvard Kennedy School

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The Development of National Payment Systems

Lessons Learned from Developing Country Payment Systems



Ajmal Ahmady
M-RCBG Senior Fellow
Harvard Kennedy School
August 2022


AFGHANISTAN
PAYMENTS SYSTEMS

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 **UPI**
UNIFIED PAYMENTS INTERFACE

 **M-PESA**

The Development of National Payment Systems
Lessons Learned from Developing Country Payment Systems

Abstract

The development of payment systems is critical to improve financial inclusion. This paper reviews the development of payment systems across four developing countries: Afghanistan, Kenya, Brazil, and India. There are two primary conclusions that we can draw from this research: (1) the development of payment systems is country-specific and dependent on a number of factors, and (2) there is no technology constraint to achieving 100% financial inclusion in developing economies. I conclude by providing a framework to understand the factors that drive development of payment systems and another framework to significantly increase financial inclusion.

To begin, we review Afghanistan's central bank (DAB) payment systems. Under very challenging circumstances, DAB was able to implement automated clearing house (ACH) and real-time gross settlement (RTGS) systems that allowed for electronic interbank payments to begin in December 2020. Furthermore, DAB was able to integrate its central switch with all telecom operators by June 2021 to allow for mobile payments between mobile wallets, as well as between mobile wallets and bank accounts.

DAB was also able to obtain the verbal agreement from all mobile network operators (MNOs) in August 2021 to create a mobile wallet for every citizen of Afghanistan, which would have allowed financial inclusion to increase from approximately 12% to 100%. Unfortunately, the Taliban takeover halted progress on these programs.

In addition to the case study of DAB's payment systems, this paper also reviews case studies from other three other countries - including Kenya's M-PESA program, Brazil's PIX, and India's UPI program. We then recommend a framework that may be of use to policymakers from developing countries that seek to accelerate the development of their own domestic payment systems. The recommended three-part framework consists of developing the proper technology stack, regulatory stack, and corporate governance structure. Finally, we provide a broader framework to increase financial inclusion more generally.

INTRODUCTION

Afghanistan is currently facing an economic and humanitarian crisis. The country had high levels of poverty, even before the Taliban takeover on August 15, 2021. The country now has almost universal poverty levels, with 24.4 million people projected to be in humanitarian need.¹ The country context, with existing sanctions on the Taliban regime, makes the provision of economic and humanitarian assistance challenging.

During the past decade in Afghanistan, I worked in senior economic positions in the Government of Afghanistan – as Economic Advisor to the President, Minister of Industry and Commerce, and Central Bank Governor. I returned to the country to serve in these positions after more than a decade working in economic development and as an emerging markets investor.

As Central Bank Governor of Afghanistan, I was able to keep inflation at close to 2%, improve the reserves management function, and introduce a modern payments system, among other achievements. DAB itself was by law an independent institution with close to 1,500 staff. The organization was overseen by a board of directors and managed by a management committee (see full organizational structure in annex), and had a single mandate of price stability. DAB also had responsibility for the development of Afghanistan’s payments systems.

More broadly, leading in Afghanistan had its own unique challenges - including dealing with significant amounts of misinformation. I hope to write about these central bank achievements in a series of papers to provide accurate information of what happened and to draw lessons that could be applied to Afghanistan now and to similar developing countries. This second paper will development of DAB’s payment systems. The primary conclusion is that central banks should be more activist in the development of their payment systems in order to increase financial inclusion to almost 100%.

PAYMENTS LITERATURE REVIEW

There is a great deal of information regarding the development of payment systems around the world. I will classify all such literature as country or region-specific reviews of payment systems, thematic reviews of payment issues, and analysis of technical factors of payment systems.

In terms of country/regional studies, BIS (2003) long ago published studies on payment systems in the Euro Area and the United States. Mas (2009) and Ng’weno (2010) review the M-PESA system and their impact on citizens in Kenya. More recently, Alfonso et al (2020) reviews Mexico’s CoDi and Brazil’s Pix payment systems, as well as the retail payments ecosystem across Latin America and the Caribbean. Cook (2022) and Mahesh (2021) review India’s UPI and both Duarte (2022) and the European Payments Council (2022) review Brazil’s Pix payment

¹ UNDP (January 2022) “United Nations Transitional Engagement Framework (TEF) for Afghanistan”

systems. The World Economic Forum (2022) also has held workshops and written about accelerating digital payments in Latin America.

In terms of thematic reviews, McKinsey provides a useful annual Payment review. Boar et al (2021) reviews interoperability between payment systems across borders. Brainard (2020) reviews several issues regarding digitalization of payments and currency. Johnson et al (2018) reviews privacy risk in mobile payments, while Manyika et al (2016) review the impact of mobile payments on financial inclusion. Visa (2021) also produced a report on interoperability of payment systems.

In terms of technical analysis and data, the Central Banks of Kenya, Brazil, and India provide monthly user numbers and transactions volumes. Hanouch (2015) reviews the use of USSD systems in mobile payments.

DAB PAYMENT SYSTEMS

We will begin our review of payment systems, beginning with Afghanistan. Afghanistan's financial system consists twelve banks (including three private banks), thousands of hawala dealers, five mobile telecom operators (MNOs), and four payment institutions (PIs). Financial inclusion was extremely low at only 12%. The majority of bank branches were only located in the major cities of Kabul, Jalalabad, Mazar-e-Sharif, Kandahar, and Herat.

In terms of payments infrastructure, a nationwide payment system did not exist. None of the aforementioned financial institutions were connected with one another. This made most payments reliant on cash transfers. For example, if an individual with an account with BMA (a local bank) wanted to send money to a customer of AIB (another local bank), the person would have to take physical cash out of BMA and physically take it to AIB.

To modernize the payment system and allow for electronic interbank payments, the country needed to host a centralized switch that could be able to route payments between banks. Depending on the country, such a system could be privately owned or hosted at the country's central bank. Such a system would then allow interbank payments to be settled electronically either through an automated clearance house (ACH) or via a real-time gross settlement (RTGS) system.

Fortunately, the World Bank (WB) had identified this as a financial sector issue as early as 2009. They funded the Financial Sector Strengthening Project (FSSP) to provide funding for the establishment of a private company (Afghanistan Payment System - APS). The WB decided on a private-sector approach with APS owned by a consortium of Afghan banks. Funding was provided for APS for the purchase of a switch and consultants to create regulations, write founding documents, and fund company expenses over several years.

The World Bank also created a mobile payments salary pilot program for the Ministry of Labor and Social Affairs (MoLSA). Through this pilot program, up to five thousand MoLSA employees were to be paid via mobile phones. However, this program did not succeed. This pilot program

registered no merchants and only a limited number of cash-out agents. As a result, as soon as their salaries were paid, MoLSA employees in the pilot program simply waited in long lines to cash out of their mobile wallet.

More broadly, although there was some progress in infrastructure and regulatory development over the ensuing years, it remained that more than ten years after initiating the project APS was still only connected to four banks, zero telecom companies, and zero payment institutions. Likewise, private sector attempts to build their own payment systems infrastructure and programs were not successful. For example, a local telecom company (Roshan) began mobile wallet program called M-PESA (modeled on Kenya's M-PESA), but had limited success and the business did not become profitable.

This was the payments context in 2020 as I began my role as central bank governor. It was clear to me that a new approach was needed. DAB therefore took three key decisions, including: (1) reformulating the technology framework - including mandating system interoperability, building a payment ecosystem, and creating a mobile platform, (2) revising various regulations related to APS fees and know-your-customer (KYC) rules, and (3) restructuring APS's corporate governance. Let me describe the importance and components of each of these three areas.

(1) APS TECHNOLOGY STACK

The first component of the reforms was in regards to the APS technical stack, which consisted of three key subcomponents: system interoperability, payments ecosystem, and mobile platform. Systems interoperability refers to the ability of different systems and institutions being able to communicate and send information to one another. The development of payments ecosystem refers to the construction of ecosystems for both users and merchants. And mobile platforms refer to the creation of systems that allows payments to be easily made on mobile systems. Let us review each area in greater detail.

(a) System Interoperability

DAB's first action was to mandate that all financial actors were connected to APS. The reason is that Afghanistan had a fragmented financial sector. No bank or telecom operator had more than 20% market share in their respective market. As such, I viewed interoperability of market participants as a prerequisite to increasing market penetration of electronic payments systems.

The reason was relatively straightforward - each company's independent electronic payments ecosystem was too small to incentive either customers or merchants to the pay up-front costs required to connect to any individual bank's payment system. However, those economic incentives would change if a customer could use their bank account or mobile wallet at any merchant or cash out point. The type and number of entities to be connected are shown in the graphic below.

DAB PAYMENTS SYSTEM: INTEGRATION STATUS

Banks		Government Institutions		Telecommunication & Payment Institutions	
AIB	BMA	SIGTAS (taxes)	ASYCUDA (customs)	Telecommunication Companies	
AZB	PB	AFMIS (salaries)	Mol Passport	Roshan (M-Paisa)	Etisilat (MHawala)
GB	NKB	Mol Passport	Kabul Traffic	AWCC (MyMoney)	MTN (MoMo)
IBA	FMBA	Kabul Municipality	Other Municipalities	Payment Institutions	
AUB	NBP	Ministry of Transport	Ministry of Education	Hesabpay	Fastpay
MB	BAL	Ministry of Foreign Affairs	Ministry of Hajj		

Source: Author's presentation

However, for various reasons, many banks and mobile operators resisted connecting to APS. Some because they generated profits from operating their own payment networks. Other financial institutions benefited from denying access to their competitors. Some banks rightfully complained about the quality of technology of DAB's service levels. To overcome this last concern, I instructed my team to operationalize two backup data sites (one in Kabul and another in India), as well as draft service level agreements (SLAs) to ensure APS could meet specific performance levels.

With this framework in mind, DAB began an integration process with banks, telecom companies, government financial systems, and merchants. The integration process itself consisted of an application programming interface (API) integration² between DAB's ACH, RTGS, and sometimes core banking supervision (CBS) system with the CBS system of the commercial banks and MNO mobile payment systems. DAB, APS management, and external consultants jointly managed the technical components of the project.

The integration process began in August 2020, when DAB announced that APS integrations were mandatory and stipulated that all banks were to be connected to DAB by end-2020 and all telecom operators were to be connected by mid-2021. There was significant pushback from the financial sector, but by December 2020 all banks were fully connected and by June 2021 all MNOs were connected to APS - allowing for full interoperability between all financial sector actors. The connection status of all institutions and types of capabilities as of May 2020 is shown in the graphic below. As the graphic shows, the integrations required multiple types of integrations (e.g. POS cash out, card-to-account) with each institution.

² A type of software integration

BANK/MNO CONNECTION STATUS

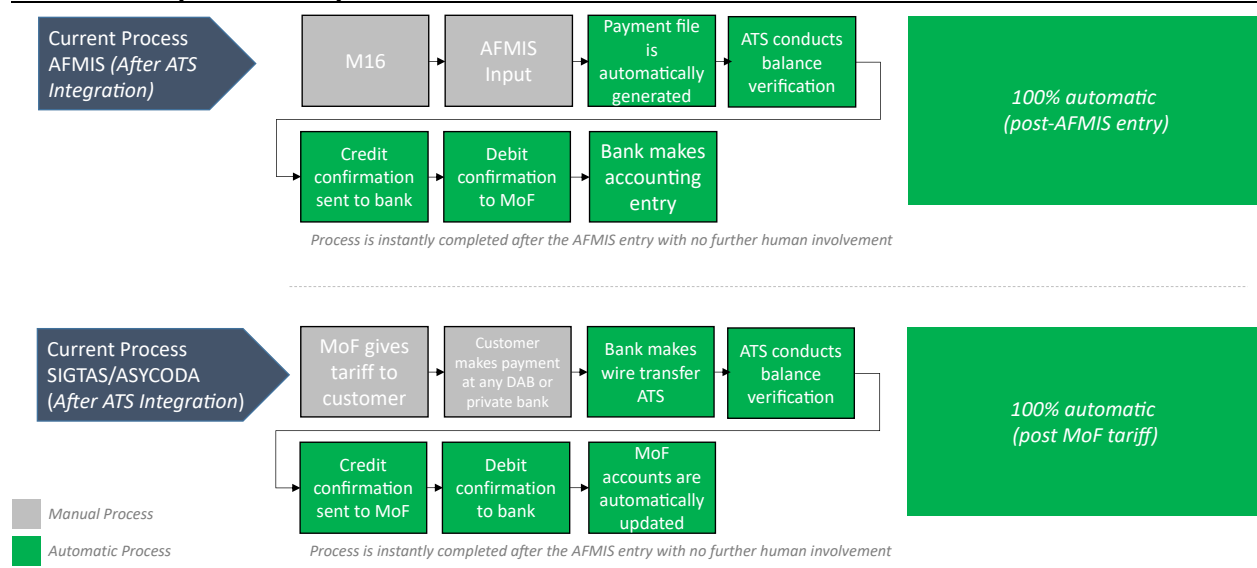
BANKS										
	POS Cash Out	POS Cash In	Bill Payment	Purchase	Card to Card	Interbank Fund Transfer	Card to Account	Card to Wallet	Wallet to Card	Wallet to Cash
BMA	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated
PB	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated
FMFB	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated
AIB	Activated	Activated	Activated	Activated	Activated	Activated	In Progress 30 May	Activated	Activated	Activated
AUB	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated
GB	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated
DAB	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated
AZB	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated
MB	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated
NKB	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated
IBA	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated

MNOs						
	Balance Inquiry	Bill Payment	Wallet to Card	Card to Wallet	Wallet to Wallet	Wallet to Cash
MyMoney	Activated	Activated	Activated	Activated	Activated	Activated
MTN MoMo	Activated	Activated	Activated	Activated	Activated	Activated
mHawala	Activated	Activated	Activated	Activated	Activated	Activated
mPaisa	In Progress 30 May	In Progress 30 May	In Progress 30 May	In Progress 30 May	In Progress 30 May	In Progress 30 May

Source: Author's presentation

DAB also connected its systems with the government financial systems, including the Ministry of Finance (MoF) tax (SIGTAS) and customs (ASYCODA) systems. Once activated, this allowed for Afghan citizens to make tax and customs payments electronically by simply visiting any bank and providing a MoF voucher to the teller.

ATS: SIGTAS / ASYCODA / AFMIS PROCESS



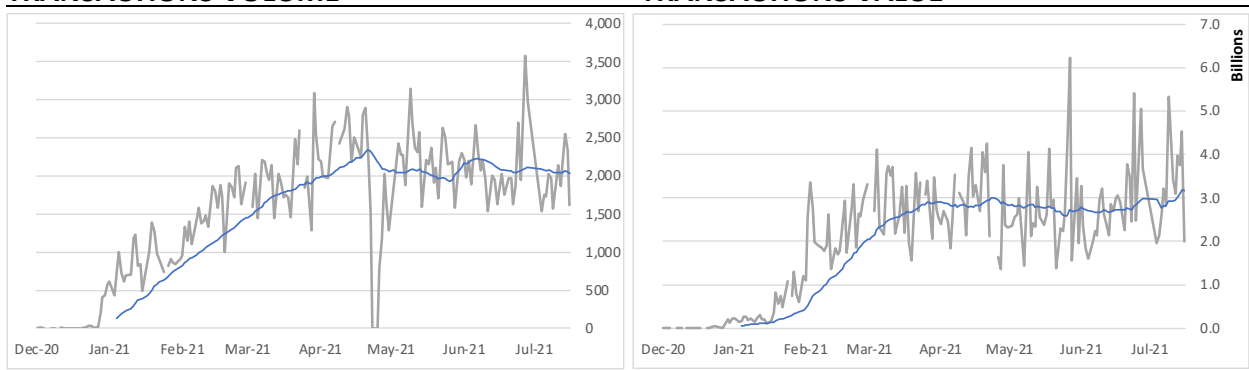
Source: Author's presentation

The integration of SIGTAS/ASYCUDA/ AFMIS with DAB’s ATS systems allowed for Straight-Thru Process (STP) for all payments. With the integration with telecom companies, payments could also be completed via APS/telephone. This is shown in the graphic above, which shows the tax and customs payment process.

With the integrations completed, bank-to-bank electronic payments began in December 2020 and mobile payments began in June 2021. This allowed bank customers to send money electronically between bank accounts by the end of December 2020, and between mobile wallets and bank accounts by June 2021. All payments were settled for small-value payments using Automated Clearing House (ACH) and for large payments using real-time gross settlement (RTGS).

TRANSACTIONS VOLUME

TRANSACTIONS VALUE



Source: Author’s data

Transactions began almost immediately upon inauguration of the program. The number of daily transactions increased steadily to an average of approximately 2,000 transactions per day, and transaction values increases to an average of 3.0 billion afghanis per day (approximately \$62 million per day). The volume and amounts didn’t significantly increase after April 2021 for unknown reasons, but I assume due to the deteriorating security and political environment in the country. However, we were expecting a further significant increases after retail payments were operationalized in August 2021.

Finally, DAB sought to further automate government payments by integrating with all government ministries. This process began but was again cut short in August 2021.

In conclusion, the integration of all the financial market participants allowed for payments to be made across institutions and platforms, including between banks, telecom accounts, and government tax and customs systems.

ATS: SIGTAS / ASYCODA / AFMIS PROCESS

Source: Author’s presentation

(b) Payments Ecosystem

The second component of DAB’s approach was to build out and expand the payments ecosystem. This was important so that electronic money would stay within the system instead of being quickly cashed out through cash agents. To build the ecosystem required expanding the use of locally-branded Afpay cards, increasing the number of merchants accepting electronic payments, and increasing the number of payment agents.

Afpay cards were APS’s own branded debit card that charged much lower fees than international cards such as Visa or Mastercard (see section on regulation below for more details). The greater use of Afpay cards would decrease fees for users and therefore increase the volume of payments processed through the APS switch. DAB therefore registered all central bank employees for the card in May 2020, and began rolling out the program to all government employees in June 2020. By August 2020, DAB had registered close to 10,000 government employees. As shown in the table below, DAB developed a schedule for the distribution of such cards.

In terms of merchant acquisition, DAB developed a merchant acquisition program to register all retailers in major urban areas. We were going to begin in major retail areas in Kabul and then expand the program to all major cities. Unfortunately, although the merchant acquisition program was developed, DAB only began the rollout of the program by August 2021 when the Taliban took over the country.

AFPAY CARD DISTRIBUTION SCHEDULE

Distributions Completed				
No	Ministry Name	No of Cards	No of Cards Distributed	Bank Name
1	Ministry of Women Affairs	159	106	New Kabul Bank
2	Ministry of Economy	42	21	Aziz Bank
3	Ministry of Frontiers and Tribal Affairs	198	82	Azizi Bank
4	Ministry of Hajj	62	62	Azizi Bank
5	Ministry of Foreign Affairs	56	51	Azizi Bank
6	MRRD	109	141	Azizi Bank
7	National Olympic Committee	135	77	New Kabul Bank
8	Ministry of Refugees	60	24	Aziz Bank
9	Supreme Court	191	254	Azizi Bank
10	Mishrano Jirga	354	255	New Kabul Bank
1	Mahkama Istinaf (Started Today)	193	43	Azizi Bank
Total		1559	1116	

Distributions Planned				
No	Gov Entity	No of Cards	Cards Distributed	Distribution Dates
1	Ministry of Communication	263		22 May, 2021
2	Ministry of Transportation	287		25 May, 2021
3	IECC	268		28 May, 2021
4	Supreme Audit Office	163		01 June, 2021
5	Ministry of Hajj (Redistribution)	579		19 May, 2021
6	Ministry of Narcotics	49		18 May, 2021
7	Ministry of Defense	6,097		20 May, 2021

Source: Author's presentation. Data as of end-May 2021

Third, the interoperability of payment systems reviewed meant that cash agents should in theory have been able to cash out any user irrespective of the location of their account or wallet. In other words, an AIB agent should have been able to cash out a MTN mobile wallet user. However, contractual agreements between banks/MNOs and agents prohibited such arrangements. Therefore, DAB worked on regulations that would have mandated interoperability between agents as well.

In sum, building out an ecosystem allows users to not only accept cash transfers, but to use electronic cash within the payment ecosystem. The deployment of locally-branded Afpay cards, the planned merchant acquisition program, and mandating interoperability between agents were steps in this process.

(c) Mobile Capabilities

The third component of the technology stack was to increase the mobile capabilities of the system. Although DAB completed its API integrations with all parties by June 2020, we relied on third-party Payment Institutions applications (PIs) to initiate mobile payments. We also realized that Afghan Banks themselves had limited capabilities to develop mobile systems. Finally, DAB quickly realized that PI applications did not increase payment transfers significantly as most Afghans did not own smartphones.

DAB therefore pivoted and created a system to allow for payments using unstructured supplementary service data (USSD). USSD is a system that allows for text-based payments using mobile phone codes, and was a system that had high familiarity with Afghans (it was the same ubiquitous system used for mobile phone credit top-up scratch cards). A further benefit of

USSD systems was that they did not require internet service. In Afghanistan, the USSD code DAB utilized was as follows:

** 246 * Destination Phone Number * Amount to be sent * Personal Code#*

Finally, to increase usage of the system further, I discussed and obtained verbal agreement in August 2021 from all MNOs to create a mobile wallet for every citizen of the country. To allow for such an action, I revised DAB KYC regulations to allow for tiered registration.

This change in regulations allowed DAB to create mobile wallet user registrations without any KYC checks, but would require identifying and additional information once the number and amounts of transactions for a user increased above certain thresholds. The implementation of such a system would have increased financial inclusion from 12% to 100% overnight, but unfortunately the program implementation was stopped when the Taliban took over in August 2021.

(2) PAYMENT REGULATORY STACK

The second leg of the payments reform program was identifying constraining regulations and revising them where necessary. Let me describe two instructive examples. The first was creating price regulations that eliminated most APS fees. Such fees were high, and were added on top of merchant acquisition fees, making electronic transactions uneconomical for many users and merchants.

Second, DAB revised its KYC regulations to allow for tiered KYC rules. The previous KYC regulations required a long list of documents to simply open a bank account or obtain a mobile wallet. A tiered KYC structure is a risk-based approach that allows for account openings with minimal or even no documentation. It then requires more information and documentation once an individual’s aggregate number or transactions or transactions amounts crossed certain thresholds. Such regulations allow for higher levels of financial inclusion by reducing initial transaction costs for small accounts. The tiered KYC regulations were structured as shown in the table below.

TIERED KYC REGULATIONS REQUIREMENTS

Required Information	Transaction Amount (individual or aggregate)				
	<250k	250k - 500k	500k – 1M	1M – 3M	3M+
Name	X	X	X	X	X
Address	X	X	X	X	X
Occupation	I	I	I	I	I
Contact #	X	X	X	X	X
ID Copy		I	X	X	X
Tazkeera			I	I	I
Source			X	X	X
Purpose			X	X	X

Documents		X		X	X
Authorization	X	X	X	X	X
License		X	X	X	X
Articles of Association				X	X
Beneficial Owner					X

All amounts in afghanis. X = required for all businesses and individuals, I = required for individuals only

As can be seen, for smaller individual or aggregate transactions of less than 250,000 afghanis (approximately \$3,000), the user must only provide some identifying information. In total, there are five tiers, each of which requires additional information to complete the transaction. This set of regulatory structure is a risk-based structure that balances AML/CFT concerns against financial inclusion concerns.

(3) PAYMENT CORPORATE GOVERNANCE

The third area of importance was revising the APS corporate governance structure. APS was constituted as a private corporation whose shareholders were initially a consortium of three private banks (later expanded to five banks). The WB provided funding for APS to hire consultants and fund APS operating expenses.

However, the World Bank project did not significantly progress despite many years of well-intentioned efforts. After almost ten years, only five of twelve Afghan banks were connected to APS. No MNOs or PIs had yet been connected. The APS staff had been receiving high international-level salaries for a decade. And there was very little oversight of the corporation. The APS board was comprised of shareholders, but the banks themselves did not conduct strong oversight given that the WB (instead of the banks themselves) paid for APS expenses. The board members therefore had little incentive to curtail APS costs. Expensive and unnecessary international trips for staff were common. APS never turned a profit.

As early as 2015, while Economic Advisor to the President, I analyzed APS operations and wrote a summary note. I concluded that the project was behind schedule, ineffective, and was not achieving its goals. Therefore, upon arrival at the central bank in June 2020, I was familiar with the situation and ready to tackle the problem. I took three key decisions in regards to APS governance and operations.

First, I brought back APS under the organizational structure of the central bank as a department. This allowed DAB to exert greater control, change its organizational structure, and reduce the importance of profits versus financial inclusion. My strategic decision was to recognize that APS would add greater value to the country as a cost center that drives financial inclusion rather than a profit center for the central bank or its shareholders.

Second, I recognized that if financial institutions were to trust the system, we needed to improve system uptime and performance. DAB therefore operationalized multiple back-up data centers, including an alternative site in Kabul and an off-site in India, and approved business continuity and disaster recovery plans.

Third, I hired staff with extensive experience in the private sector to manage the above reform program. The new team was able to move quickly with API integrations with all third parties, operationalize two back-up data centers, and improve APS operational performance in a short period of time.

Afghanistan Payments Conclusion

DAB was able to implement functional ACH and RTGS systems in very challenging circumstances. As a result, electronic interbank payments began in December 2020 and mobile payments became functional by June 2021. Every Afghan citizen was set to receive mobile wallets in August 2021 before the Taliban took over.

The success of these reforms was due to reforms in three areas: (1) crating a suitable technology stack: mandating interoperability, developing a payments ecosystem, and building mobile capabilities, (2) revising regulations that lowers payment fees and allows for tiered KYC, and (3) improving corporate governance.

DAB PAYMENT SYSTEM CAPABILITIES

	Previous Process	New Process	Implementation Date
(1) Bank-to-Bank Transfers	<u>Cash-Based System</u> Customer would take cash out of one bank and physically deliver to second bank	Electronic Payments Customer can visit their bank and electronically transfer funds to another bank	✓ Implemented December 2020
(2) ATM Interoperability	<u>Limited Interoperability</u> Customer could only use his bank's own ATM network, limiting financial outreach	Full Interoperability Customers can now use their ATM card at any bank ATM	✓ Implemented December 2020
(3) Peer-to-Peer Payments	<u>Limited Interoperability</u> Payments could only transact within their mobile network, limited transfers to up to 15% of population	Full Interoperability Customers can send funds to anyone, irrespective of bank or MNO that they use	✓ Full functionality by End-June
(4) Government Payments	<u>Cash-Based System</u> Citizens would have to visit ministry to obtain invoice and then make payment at DAB branch	Electronic Payments Customers will soon be able to make all payments using their phones from invoice received from ministries (as long as they connect with DAB infrastructure)	✓ Full functionality by End-July

Source: Author's presentation

INTERNATIONAL PAYMENT CASE STUDIES

There has been significant progress during the past two decades regarding the development of payment systems throughout the world. In this section, we shall review the case studies of three such systems, including Kenya's M-PESA program (launched 2007), India's UPI program (launched 2015), and Brazil's PIX (launched 2020). Although there are many countries to choose

from, we selected these three countries due to the varying degree of success of these three systems.

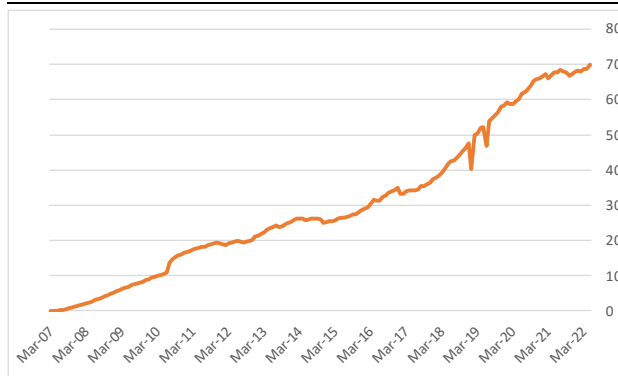
(1) Kenya's M-PESA

Kenya's M-PESA system is a mobile payments system that was launched in 2007. The system grew from only 1 million accounts by the end of 2007 to more than 70 million accounts by 2022 – more than Kenya's total population of 54 million.³ There are approximately 300,000 agents supporting the system, and on a monthly basis these agents provide 193 million cash in/out's worth 700 billion Kenyan shillings (~\$5.8 billion).

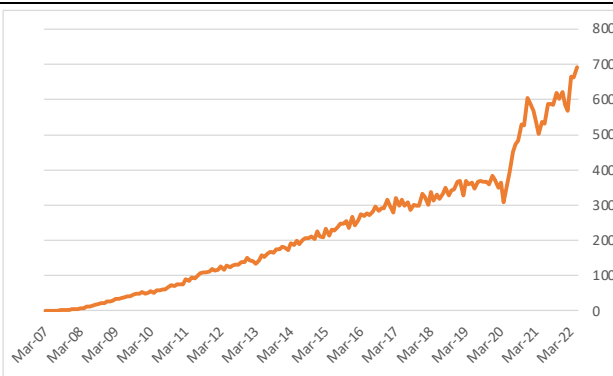
Let us examine the key drivers for the success of M-PESA. In particular, I argue that industry structure is a prime driver of M-PESA's success story in Kenya, and that there were three unique characteristics of the Kenyan market that allowed for its success: (1) Safaricom's ownership structure - with the government of Kenya being a large shareholder, (2) the regulatory flexibility of the Central Bank of Kenya (CBK) that allowed M-PESA to initially begin operations, and (3) Safaricom's large market share. Let me describe each of these areas.

First, in terms of ownership, M-PESA was started by a consortium of Vodaphone and state-owned Safaricom. The Government of Kenya owns 35% of Safaricom through state-owned Telkom Kenya, which provided an incentive for the government to support the growth of Safaricom. This gave the company implicit state support, or at a minimum, that the state likely treated the company as a state-owned enterprise, as well as provided Safaricom access to the CBK to request a waiver to begin operations.

M-PESA ACCOUNTS



M-PESA TRANSACTIONS VALUE



Source: Kenya Central Bank

Second, the Central Bank of Kenya (CBK) provided a letter of comfort to Safaricom that the company would not be regulated as a bank. This flexibility allowed Safaricom to begin money transfers without the regulatory burden of banking oversight.

³ Central Bank of Kenya mobile payments data

Third, Safaricom has a very large and almost monopoly-like 70% market share. This reduced the need for interoperability with other MNO operators as Safaricom’s market share meant that M-PESA expansion could take place almost entirely within Safaricom’s own network. However, there are also downsides of a large market share. In particular, the downside of this approach is the same as for any monopoly market, as Safaricom’s large market share meant that fees did not come down as much as in other countries. A few years after its launch, M-PESA commissions for peer-to-peer (P2P) payments was still \$0.40, even for smaller payments of as low as \$1.3 (i.e. a 30% fee of the amount sent).⁴

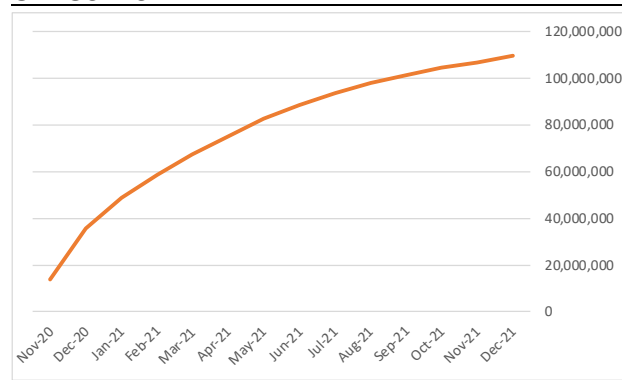
The M-PESA system was the first of its kind in the world, and gave hope that similar mobile payment systems could be launched in countries around the world. However, almost fifteen years after M-PESA was launched, companies and regulators struggle to implement similar mobile payment systems. In fact, the owners of M-PESA themselves tried to expand internationally but found little success.

I argue that that the unique market structure and combination of these three factors mentioned above allowed for M-PESA’s success in Kenya, and the lack of a similar market structure in other countries prohibited them from replicating the model – until recently. Next, let us review India’s UPI system, which launched in 2015, and how it overcame the challenges above to create a successful payments ecosystem.

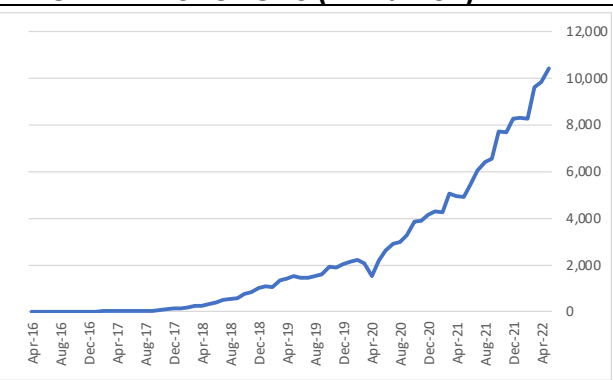
(2) India’s UPI

The Reserve Bank of India (RBI), in conjunction with the Indian Banks Association (IBA) formed the National Payment Corporation of India (NPCI) in 2008 to consolidate and accelerate the country’s payment systems. NPCI went on to create the Unified Payments Interface (UPI), which forms the backbone of India’s payment transformation. The UPI system now has more than 100 million users in India, and connects these users through more than 300 banks. There are now more than 38 million annual transactions that transmit \$125 billion per month through the system.

UPI USERS



UPI TRANSACTIONS (INR billion)



Source: India NPCI

⁴ <https://www.marketlinks.org/sites/default/files/resource/files/Three%20Keys%20to%20M-PESA%27s%20Success.pdf>

NPCI was formed under the provisions of the Payment and Settlement Systems Act of 2007,⁵ and was incorporated as a “Not for Profit” Company under the provisions of Section 25 of Companies Act 1956 (now Section 8 of Companies Act 2013), with an intention to provide electronic payment and settlement systems and infrastructure to the entire Banking system in India.

The origin of Unified Payments Interface lies in the government’s Digital India initiative and efforts to facilitate welfare payments with a three-tiered approach known as the “JAM Trinity”⁶ or the India Stack.⁷ The three components are (1) *Jan Dhan*: an affordable, “no-frills” bank account, (2) *Aadhaar*: a unique biometric identification number, and (3) mobile banking.⁸ The development of UPI reflects the culmination of these efforts, though significant work remains to achieve meaningful financial inclusion for wide swaths of India’s population.

To implement Aadhaar, the Indian government created the Unique Identification Authority of India (UIDAI) in 2009 in order to create the world’s largest one-sweep identification system. Aadhaar - a unique, 12-digit identifier for every Indian resident linked to demographic, residential, and biometric data.⁹ Before Aadhaar, India faced extensive problems with identifying its then population of more than 1.2 billion. Various available ID systems such as the driver’s license, voter ID, permanent account number, and ration card lacked interoperability. However, as of June 2021, 99% of India’s adult population now had an Aadhaar card issued to them.¹⁰

In addition, the NPCI launched Aadhaar Payment Bridge System (APBS) and Aadhaar Enabled Payments System (AEPS), which residents with an Aadhaar and bank account could access.¹¹ The APBS-AEPS network enabled a direct-to-beneficiary-transaction system, which formed the bedrock of India’s massive Direct-Beneficiary-Transfer (DBT) system.

On the heels of Aadhaar, NPCI launched e-KYC (Know Your Customer) in 2012. This system solved the earlier problem of lack of identification in banking as businesses and banks could now perform KYC verification digitally using biometrics or the mobile OTP linked to Aadhaar.¹² In 2014, the final component of the JAM (Jan Dhan – Aadhaar – Mobile) triad, Jan Dhan was implemented. This system created one of the largest financial inclusion initiatives in the world

⁵ Mahesh, A. & Ganesh Bhat, *Digital Payment Service in India - A Case Study of Unified Payment Interface*, 5 INT’L J. CASE STUDIES IN BUSINESS, IT, & ED. 256-265 (2021), <http://doi.org/10.5281/zenodo.5091207>.

⁶ See Shamika Ravi, *Is India ready to JAM?*, Brookings (Aug. 27, 2018), <https://www.brookings.edu/research/is-india-ready-to-jam/>

⁷ See CARRIÈRE-SWALLOW ET AL, STACKING UP FINANCIAL INCLUSION, INTERNATIONAL MONETARY FUND (July 2021), <https://www.imf.org/external/pubs/ft/fandd/2021/07/india-stack-financial-access-and-digital-inclusion.htm>

⁸ See RAVI supra note 1.

⁹ Nisha Holla, *Democratising Technology for the Next Six Billion: India’s ‘Digital Public Goods’ Innovation*, OBSERVER RESEARCH FOUNDATION (Nov. 16, 2021).

¹⁰ *Id.*

¹¹ *Id.*

¹² *Id.*

and has thus far provided more than 430 million Indians with a digitally accessible bank account.¹³

Next, I review the three components of the UPI system. First, UPI is an interbank transfer system (there are now over 300 member banks, after initially launching with 9 participating banks). Second, it is a real-time payments system. Third, it is 'open' - meaning technology companies can build applications that help users directly manage transfers into and out of their accounts held at banks.

To enable payment using your phone, all one needs is a mobile payment application and the virtual address of the payee (e.g. ajmal@BankofIndia).¹⁴ It is free of charge and instantaneous, though the system does require a bank account.¹⁵ The system does have a maximum limit on UPI transactions, which has long been set at Rs.100,000 per account, per day, though various banks may have set lower limits. However, in May 2021, the Reserve Bank of India announced that this limit would be raised to Rs. 200,000.

One of the most notable features of UPI – and the feature that has driven tech companies like Google to champion UPI's design – is that it separates customer experience from account ownership. Customers can use the app of any bank or non-bank to initiate a UPI-based payment, regardless of which institution holds their account. Even fintech companies that do not directly participate in UPI (e.g., Google Pay) can access UPI indirectly through a participant, with commercial terms separately negotiated with that participant. While there is no requirement for UPI participants (i.e., banks) to offer access, the large number of participating banks all but ensures some way into the party.

The greatest utilization of UPI has come from fintech companies. Google Pay, PhonePe, and Paytm all offer UPI payment method. Based on adoption, PhonePe, which is owned partly by WalMart, had the greatest number of UPI transactions in September 2021 (1,653.19 mn), followed by Google Pay (1,294.56 mn) and Paytm (462.71 mn).¹⁶ However, both Paytm and PhonePe offer “wallet” services that let users store money for prepaid payments. Google Pay offers no wallet, and the money continues to get deducted from the bank. Though most payments on these services go through UPI, Paytm has also emphasized that it completes many

¹³ *Id.*

¹⁴ The simplicity of the virtual addresses is considered a major advantage over previous technologies, which required exchanging bank account numbers. See Byas Nambisan & Aashika Jain, *What Is UPI And How Does It Work?*, FORBES (June 4, 2021), <https://www.forbes.com/advisor/in/personal-finance/what-is-upi-and-how-does-it-work/>

¹⁵ *Id.*

¹⁶ *Paytm vs PhonePe vs Google Pay: Which Digital Payment App Should You Use*, News 18 (Oct. 28, 2021), <https://www.news18.com/news/tech/paytm-vs-phonepe-vs-google-pay-which-digital-payment-app-should-you-use-4373702.html>

on-platform transactions without utilizing UPI. The enormously popular app WhatsApp has recently announced a UPI payment feature.¹⁷

In terms of regulations, the following are some key issues that NPCI is dealing with:

- *Interoperability*: Consumers can only send payments to people who have the same mobile wallet, and some merchants only accept certain wallets. However, starting April 2022, a fully vetted user of prepaid payment instruments or digital wallets—one who has fulfilled all know-your-customer (KYC) norms—will be able to send and receive money cross platforms.¹⁸ For card-based Prepaid Payment Instruments, interoperability will be achieved via card network interoperability and for e-wallets through the Unified Payments Interface (UPI).¹⁹ Interoperability is expected to help wallets claw back the space they had lost to banks and other players with the rise of Unified Payments Interface (UPI) and the new KYC requirements
- *Concentration Limits*: In November 2020, NPCI capped the volume of United Payment Interface-based transactions for third-party payment apps such as Phone Pe, Google Pay and WhatsApp to 30% of the total volume of transactions processed in the preceding three months on a rolling basis.²⁰ Operators are required to comply with this norm by January 2023.²¹ When WhatsApp launched its UPI-based payments interface in India, NPCI initially limited the app to 20 million users out of a concern that the system would not be able to handle a sudden surge in transactions. NPCI increased this cap to 40 million users in November 2021²²
- *Fees*: Person-to-person (P2P) and merchant transactions were initially allowed to carry limited fees with interchange rates applied. However, India’s Ministry of Finance revised guidance late in 2019 to prohibit any customer or merchant fee over UPI, while mandating acceptance for businesses with > Rs 500 million (about \$7 million) in annual sales²³

¹⁷ Chandra Srikanth & Priyanka Iyer, *NPCI increases WhatsApp UPI payment cap to 40 million users from 20 million*, MONEY CONTROL (Nov. 27, 2021), <https://www.moneycontrol.com/news/business/npci-increases-whatsapp-upi-payment-cap-to-40-million-users-from-20-million-7767591.html>

¹⁸ *RBI makes mobile wallet interoperability mandatory from FY23*, THE ECONOMIC TIMES (May 19, 2021), https://economictimes.indiatimes.com/tech/tech-bytes/rbi-makes-mobile-wallet-interoperability-mandatory-from-fy23/articleshow/82777061.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

¹⁹ *Id.*

²⁰ Chandra Srikanth & Priyanka Iyer, *NPCI increases WhatsApp UPI payment cap to 40 million users from 20 million*, MONEY CONTROL (Nov. 27, 2021), <https://www.moneycontrol.com/news/business/npci-increases-whatsapp-upi-payment-cap-to-40-million-users-from-20-million-7767591.html>

²¹ *Id.*

²² *Id.*

²³ William Cook, *Comparing India’s UPI and Brazil’s New Instant Payment System*, PIX, CGAP (Feb. 2, 2021), <https://www.cgap.org/blog/comparing-indias-upi-and-brazils-new-instant-payment-system-pix>

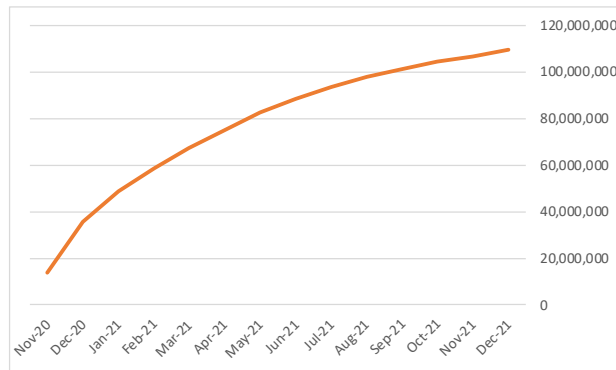
- *Offline payments:* Following a successful small scale trial run, the RBI announced that it intended to implement a nationwide framework to enable offline digital payments. It is not clear though whether the framework will directly involve the UPI system²⁴
- *Local cards (RuPay):* Another important part of the Digital India initiative involves expanded access to RuPay cards.²⁵ Another NPCI effort, Rupay offers both debit and credit cards. These are accepted at all ATMs, by point-of-service machines in India, and for domestic online. RuPay cards received an important boost in 2020 when public sector banks issued 258 million RuPay debit cards as part of the Pradhan Mantri Jan Dhan Yojana scheme, one leg of the JAM Trinity²⁶

India’s UPI system has been a significant success story in India, allowing greater financial inclusion for the more than 100 million accounts to process more than a trillion dollars per year through the system. The Reserve Bank of India, through the NPCI, allowed a private sector approach but intervened where necessary to create a system that was interoperable, open, and much easier to use than previous systems.

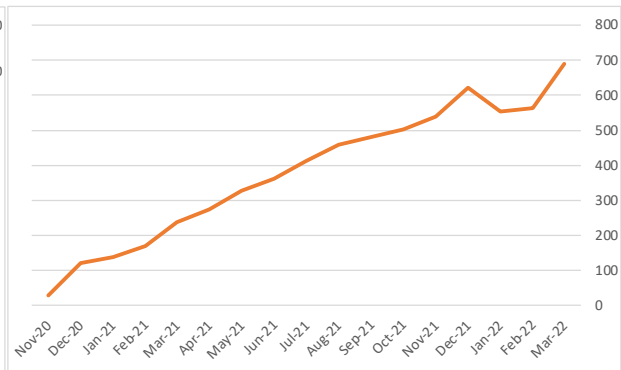
(3) Brazil’s Pix

The Central Bank of Brazil (BCB) introduced the Pix system in 2019, and officially launched it on November 16, 2020. In a brief period of time, the majority of Brazilians were using the system. The BCB created Pix to spur increased competition in the country’s payment industry. A case study on the Pix system is already being taught at the Harvard Business School.²⁷ The system now has more than 100 million users transacting 700 billion reals per month.

PIX USERS



PIX TRANSACTIONS (BRL billion)



Source: Central Bank of Brazil Pix Statistics

²⁴ Preeti Motiani, *Soon make digital payments without internet anywhere in country: RBI to roll out formal mechanism*, THE ECONOMIC TIMES (Oct. 8, 2021), <https://economictimes.indiatimes.com/wealth/save/soon-make-digital-payments-without-internet-anywhere-in-country-rbi-to-roll-out-formal-mechanism/articleshow/86859784.cms>

²⁵ Ishan Shah & Tarika Sethia, *All about RuPay, India’s payments network*, THE ECONOMIC TIMES BFSI (Aug. 2, 2021),

²⁶ *Id.*

²⁷ Cohen H. & Hagist S. “The Instant Payment Mandate: The Central Bank of Brazil and Pix” (December 2021)

There were four reasons for the success of Brazil's Pix system. First, it was easy to use. Like India's UPI, Brazil's Pix system uses four ways to identify a user's account, including a phone number, email address, CPF/CNPJ (a social security number), or a random key. The user could register one of these address keys with their financial institution or payment institution.

Second, the central bank of Brazil took an activist position in regards to corporate governance. The system was created similarly to Afghanistan's payment system. In particular, Pix is owned and operated by the country's central bank. Like in Afghanistan, it was clear that private sector participants were not going to modernize the payment infrastructure, and the regulator had to take a more active stance.

As a result, the BCB mandated that 35 large banks that represented 90% of all transactions must participate.²⁸ Please note that this is also a relatively similar position that the Federal Reserve has taken with the development of the FedNow system, which has spurred private banks to create the competing real-time payments (RTP) system (although the two systems are not yet interoperable).

Third, the Pix system has a low-cost structure. The BCB came to the same conclusion as DAB, and saw Pix as a platform for increasing financial inclusion, spurring innovation, and increasing competition – rather than as a profit center. This had the impact of reducing fees from an average of BRL0.40 to only BRL0.01, a fee reduction of 97.5% per transaction.²⁹ The BIS has estimated that Pix costs an average of 0.22% of a transaction's value versus debit cards at close to 1.0% and credit cards at 2.2%.

Fourth, the Pix technology stack has an open architecture, allowing for API integrations, spurring additional innovation. In particular, allowing for API integrations allows for banks, payment institutions, and international remittance companies to innovate and build apps and programs with additional functionality on top of the Pix system. Customers can now use a QR code to make or receive payments. As a result of this open architecture, the Pix system has been the catalyst for the development of a fintech ecosystem in Brazil.

This combination of the regulator taking a more active position, an activist corporate governance structure by the central bank, and a low-cost fee structure for provision of these services, and an open technology architecture has led to almost half of Brazil's population (115 million persons) to adopt Pix. Likewise, the value of transactions has increased to more than 700 billion reais per month.

CONCLUSION

This paper provided a summary of how Afghanistan and other nations developed their payments infrastructure. The importance of payments infrastructure is important for financial inclusion and economic growth, but has been largely overlooked over the past few decades.

²⁸ Cohen H. & Hagist S. "The Instant Payment Mandate: The Central Bank of Brazil and Pix" (December 2021), p.4

²⁹ <https://www.paymentsjournal.com/why-pix-is-the-revolution-of-consumer-experience-in-brazil/>

Countries that focus on the development of their payments systems will realize economic dividends from their investments.

We conclude by providing a three-part framework for other countries that want to advance their payment system architecture:

- **Technology Stack:** The technology stack includes three sub-components, including system interoperability, payments ecosystem, and development of mobile platforms
- **Regulatory Stack:** Identify and revise relevant regulations that either impede or could catalyze electronic payments adoption, including price regulations to lower user fees, tiered KYC to make payment adoption easier to begin, or quality of service regulation to ensure system reliability
- **Corporate Governance:** The central bank should consider whether the manager of the payment system should be constituted as a separate legal entity or whether it should be managed by the central bank itself

Applying this framework to the three countries we analyzed, we can see that the framework gives rise to unique implementation modalities depending on country context and industry dynamics.

PAYMENT SYSTEMS RECOMMENDED DEVELOPMENT FRAMEWORK

Component	Technology Stack	Regulatory Stack	Corporate Governance
Kenya	No interoperability, text based, large number of agents	Unregulated costs, tiered KYC	Private company
India	Some interoperability, mobile platform, ecosystem	Regulated costs, tiered KYC	Corporation with Central Bank as shareholder
Brazil	Interoperability, Mobile platform, ecosystem	Regulated costs, tiered KYC	Central Bank
Afghanistan	Interoperability, Mobile platform, ecosystem	Regulated costs, tiered KYC	Central Bank

The framework is also useful in identifying differences across countries. For example, the high cost of mobile payments in Kenya (despite being the first to launch) is due to the monopoly-like structure of the market and a lack of strong price regulations. Therefore, as industry modes such as the Porter framework would suggest, Safaricom is able to extract higher profits from this market.

Compare this industry structure with those in India, Brazil, and Afghanistan, where the central bank acts with various degree of shareholding interest and provides price regulations and

mandates greater degrees of interoperability, which create greater competition and hence lower prices and options for users.

However, the key conclusion is that there are currently no real technology impediments to achieving high levels of financial inclusion in every country in the world. The key constraint thus far seems to be the proper strategic approach and implementation strategy, which I hope can be resolved using the proposed framework.

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