U.S. Faster Payments Council: Directory Models Work Group

Member-Facing Resource

October 2022_DMWG Research Detail

International Best Practices in Directory Models White Paper

International Best Practices in Directory Models Research Details

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U.S. Faster Payments Council: Directory Models Work Group

Bizum

Bizum

Summary of the System Profile

Instant adoption as of 2021

High

Main Use Cases Supported by RTP

P2P	C2B e-commerce	C2B POS	B2B	B2C Only returns	G2C	G2B
●	●	●	○	●	○	○

Summary

Bizum is a payment service embedded within the banking app of participating banks; users must have a current account at a participating bank in order to use the service. The Bizum functionality is therefore an option (P2P, request money from an individual, C2B both online and e-commerce) within the app. Participating banks connect to Bizum via Redsys, the Spanish tech provider that offers gateway services between the banks and Iberpay, the Spanish ACH. The directory is closed-loop, so only users with accounts at participating banks can participate. Bizum does not store any personal data; Bizum connects each phone number to a bank, which then fills in the account information required to process a payment. If users change their phone number or want to change the account to which their phone number is connected, they are responsible for doing so with their bank. Each bank is responsible for securing customer data and for linking phone numbers to IBANs.

All payments go through the real-time module of SNCE, the SCT Inst-compliant system operated by Iberpay; no other payment rails nor directories are supported or in any way reachable. Users register with the Bizum service using a mobile phone number; email or other types of aliases are not supported. Each mobile phone number can only be tied to one account.

By 2020 Bizum was used around 10 times per year per user (about 4 years after going live), and volume in 2020 more was more than double 2019's figure. Volume in 2021 was over 500 million, equating to over 25 transactions per customer. Electronic payments in general are not as popular in Spain as in other SEPA countries, making Bizum usage even more impressive. After initially being limited to P2P payments, Bizum has expanded to C2B and B2C refunds.

Key Facts & Figures

Population (in millions, 2021)	47.6
Markets where service is active	Spain
Currency	Euro
Year service went live	2016
Number of users	19.1m
Number of merchants onboarded	>26,700 e-commerce merchants & ~5,200 NGOs
Transaction values	EUR 0.50-1,000
Payment rails enabled	Real-time A2A

Sources: https://bizum.es/en/how-does-it-work/; https://data.worldbank.org/indicator/NY.GDP.MKTP.CD; https://www.globaldata.com/; Interview with Bizum employee

Connecting to Bizum: FIs & End Users

Participants connect via Redsys, a Spanish gateway provider

How sending/receiving institutions connect to the directory

Only participating banks can offer Bizum; third party apps are not supported. Redsys connects the Bizum directory (linking phone numbers to specific institutions) to each bank's internal directory (which links phone numbers to individual accounts or IBANs). All Bizum payments are processed over the real-time module with the SNCE system; no other payment types are supported.

Bizum was launched in 2016, prior to the launching of the real-time system in Spain and the Euro Zone (SCT Inst, which launched in November 2017). The system originally processed transactions through the standard same-day/next-day ACH system but was moved over to the real-time system shortly after it went live.

How end users register to the directory

Consumers

First, customers select a bank where they have an account and that supports Bizum. They then download the app and connect to online banking and log-in. After accessing the Bizum area or send/receive money with Bizum, users must accept the Ts&Cs. Only one telephone number can be associated with 1 IBAN (and vice-versa). The telephone number does not need to be a Spanish number.

1. User opens their bank app and inputs their mobile telephone number
2. The phone number is registered with the bank, Santander
3. Santander sends the phone number and Bank Identifier Code (BIC) via Redsys (3) to Bizum (4).

5. Bizum confirms the consumer's registration via Redsys and the consumer's bank (5).

Merchants and NGOs

Merchants and NGOs can connect to Bizum in a very similar to process to how they apply to accept card payments with enhanced POS functionality coming in 2022. While Bizum supports physical POS payments, the main focus has been for e-commerce or online donations for NGOs.

Sources: https://bizum.es/en/send-and-receive-money/; Interview with Bizum employee

Directory Set-Up, Maintenance, & Security

Bizum holds no account data; banks responsible for securing data

Types of aliases supported by the directory

Mobile phone number is the only alias accepted to by the directory.

Securing the directory

The Bizum service is a two-step directory. When a customer registers with Bizum, the Bizum directory stores linking the customer's phone number to their financial institution; no account data is held by Bizum. Each bank has an internal directory that connects to the Bizum directory via Redsys, and this directory links the customer's phone number to the account information, the IBAN. This means that the Bizum directory does not store any valuable customer information; banks are required to store and secure customer information. Customers must consent to Bizum and their bank storing and sharing account information to comply with GDPR requirements.

Ensuring the information in the directory is current

End users are required to ensure that their alias (phone number) is linked to their IBAN. If a user changes their phone number, they will need to register this number with their bank and change it within Bizum.

Is the directory open or closed?

The directory is closed; only customers of participating banks can access the directory and Bizum cannot send payments to non-Bizum-affiliated services (except accounts at participating banks that have not registered for the Bizum service).

The directory is not searchable. Users input a phone number, which then routes the payment message to a connected IBAN. No account data is exposed to end users, i.e., the sending party cannot see the receiving party's IBAN using the Bizum directory. When a phone number is input to Bizum, the directory returns the full first name and the first letter of the last name of the name registered to that phone number. This information can be retrieved by fraudsters by inputting phone numbers, but no account-sensitive information is shared.

Sources: https://bizum.es/en/send-and-receive-money/; Interview with Bizum

Bizum Transaction Flow

P2P and C2B transactions have very similar message flows, though acquirer involved

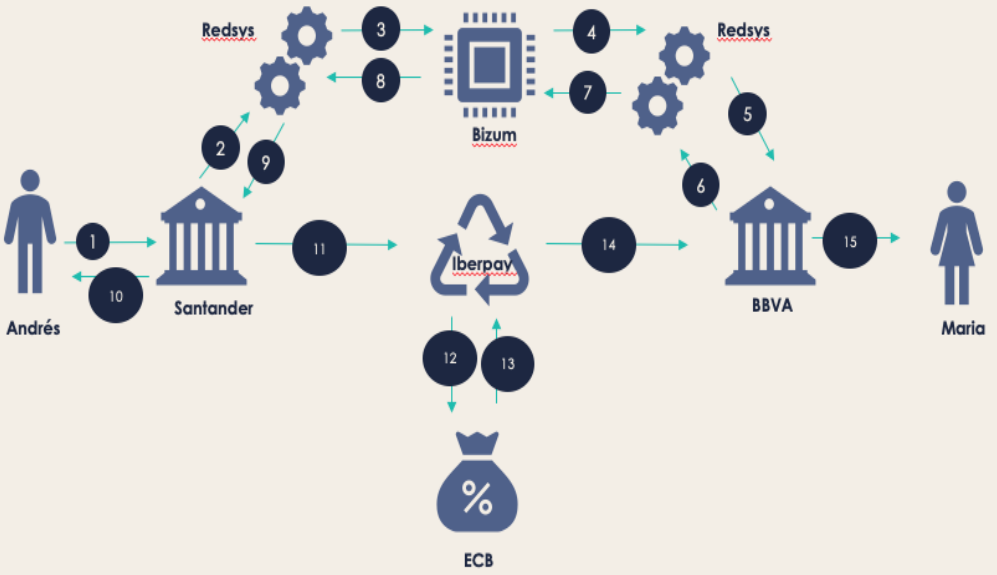
Transaction flow: P2P

Andrés wants to pay Maria back for lunch . (1) Andrés opens up his mobile banking app from his bank, Santander, and navigates to the section where he can make a Bizum payment. Andrés chooses Maria as the recipient from his phone's address book. Santander sends Maria's phone number via Redsys (2) to Bizum (3). Bizum knows that Maria's phone number is linked to BBVA and so sends the request via Redsys (4) to BBVA (5), where BBVA fills in Maria's IBAN to Redsys (6) and then Bizum (7). Bizum returns the message to Redsys (8) and Andrés' Santander app (9). Andrés sees that Maria can accept Bizum payments and that it is indeed Maria L. on the account (10) and confirms the transaction.

Santander sends the payment (11) to Iberpay, the Spanish ACH operator. Iberpay settles the payment in real time via its settlement account at the ECB (12), which then confirms that settlement indeed took place (13). Iberpay notifies Santander that the payment went through and credits BBVA's account(14).

Maria is then notified via the Bizum functionality in her BBVA app that Andrés has sent her the €15 for lunch.

For e-commerce payments, Andrés chooses Bizum as his payment message and then inputs his phone number into the merchant's site. The merchant's acquirer sends a request-to-pay to Andrés mobile banking app via Bizum. Andrés accepts the request and verifies his identify either via a Bizum code that he used when registering or via the bank's own authentication system (often thumbprint or facial ID).



Not all message flows are displayed for the sake of clarity

Sources: https://bizum.es/en/send-and-receive-money/; Interview with Bizum

P2P & E-Commerce Have Exploded in Spain

Bizum's pricing is competitive with card acceptance; UX key to success

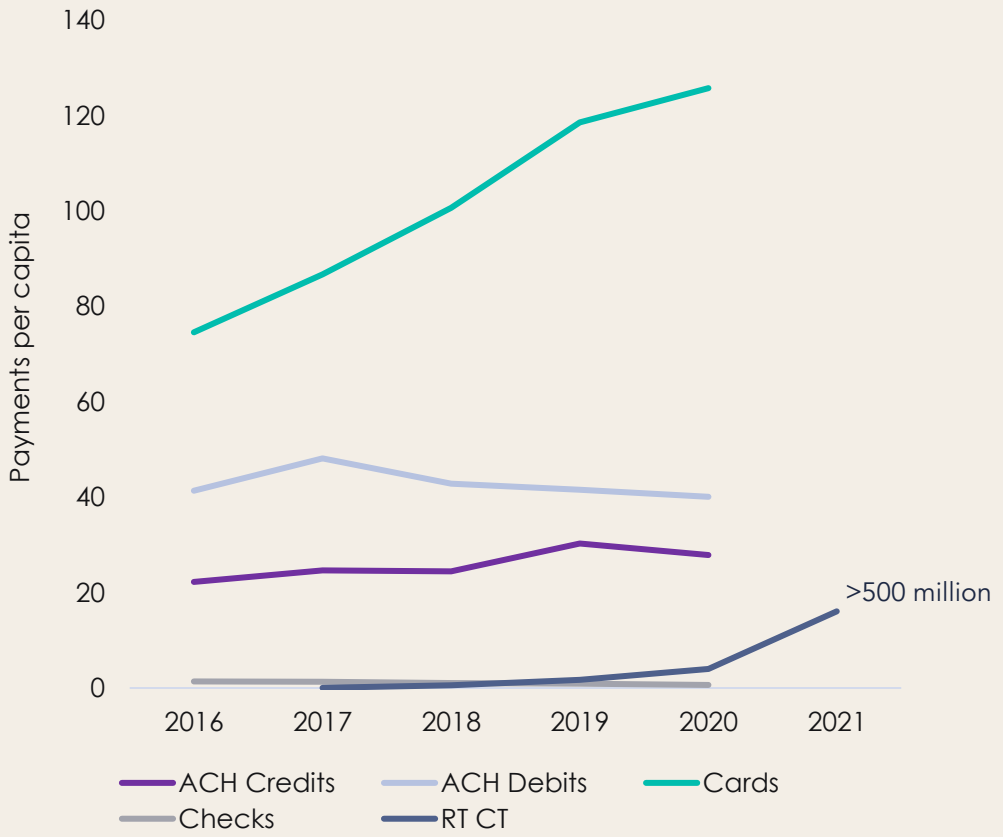
2021 was Bizum's breakout year

Bizum started off as a P2P app embedded in consumer's mobile banking apps and settled payments on a same-day/next-day basis (depending on the day and time of initiation). After SNCE's instant module went live at the end of 2017, Bizum migrated to SCT Inst, though it admittedly took several years before the service gained traction. By 2020 yearly per capita usage was at 4, with the number of transactions per user more than double that figure. The combination of the pandemic and Bizum's expansion into the e-commerce and POS space, however, led to explosive growth in 2021, where over 500 million transactions were recorded, corresponding to over 26 payments per user.

Bizum has a minimum transaction value of EUR 0.50 (~ USD 0.56) and a maximum of EUR 1,000 per transaction. There are also limits in terms of the amount of money users can receive per day (EUR 2,000) as well as the number of transactions that can be made per month (60). B2C cash back functionality has not been commercialized yet, but there are plans to launch this in 2022.

In terms of pricing, Bizum is free for P2P transactions, while the fee that merchants pay to accept a Bizum transaction is competitive with the cost of accepting domestic cards, which tends to be cheaper than international card brands. Bizum is owned by the Spanish banks in the same way the ACH (Iberpay), gateway provider (Redsys), and domestic card scheme.

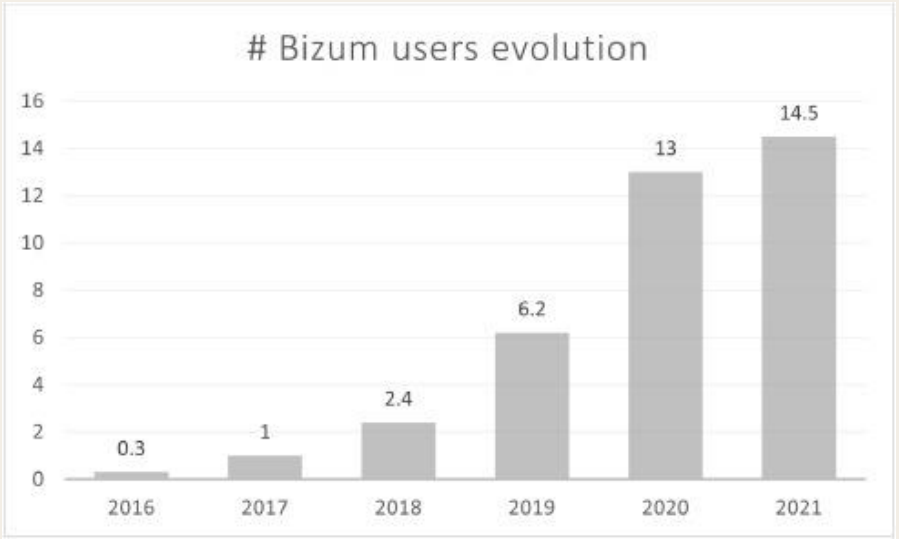
Interbank non-cash payments per capita, 2016-2020



Sources: https://www.globaldata.com/; https://bizum.es/en/frequently-asked-questions/; https://sdw.ecb.europa.eu/browse.do?node=9691149; Interview with Bizum employee

Lessons Learned for the U.S. Context

Bank ownership & retention of customer data key to receiving bank support



Source: The development of alternate payment methods and their impact on customer behavior: The Bizum case in Spain by José María Visconti-Caparrós and Juan Ramón Campos-Blázquez

Sources: https://data.worldbank.org/indicator; https://bizum.es/en/frequently-asked-questions/; Interview with Bizum; graphic available here: https://www.sciencedirect.com/science/article/abs/pii/S0040162521007617

Comparing Spain and the U.S.

Spain is still a very cash-heavy economy and has a more concentrated banking market than the U.S. (in 2017 Spain's CR5 was 85.8 compared to 46.2 for the U.S.). Bizum is only about a year older than Zelle, but it was created in conjunction with the large Spanish banks and with general support from Spain's banking sector from day 1. That, combined with the high degree of concentration in the Spanish banking industry and the inclusion of Bizum's functionality directly into the banking apps, helps explain the explosion in adoption 5 years after launching.

In contrast to the U.S., the Spanish market does not have any major domestic competitors to Bizum other than PayPal, partially because the banks were proactive about launching their own system; this of course lessons the overall utility of applying the Bizum example to the U.S. market.

Lessons learned for U.S. market

The case of Bizum demonstrates the utility of bank-backing for a directory. Outsourcing the operation of the directory of directories to a joint company owned by the backers enables a small group to concentrate on things like securing the directory, expanding beyond the P2P use case, onboarding merchants, and adding functionality to the core payment service. Furthermore, enabling the banks to be in charge of customer data limits the risk of having a centralized directory from a data protection perspective.

Conclusion

In terms of the core attributes identified by the Working Group (safety, interoperability, and governance), the Bizum directory fulfills at a minimum of 2 (safety and interoperability), if not all 3. Going back to the 8 characteristics, it fulfills at least 7 (all but #3, supports multiple routes linked to payment alias).

U.S. Faster Payments Council: Directory Models Work Group

Interac

Interac

Summary of the System Profile

Adoption Not Applicable

Main Use Cases Supported by Interac

P2P	C2B e-commerce	C2B POS	B2B	B2C	G2C	G2B
●	○	○	●	●	○	○

Summary

Interac is a privately-held, for-profit organization. Interac owns and operates the Canadian domestic card scheme switch and built the e-transfer service off of this network. Interac does both messaging and settlement for the Canadian market for its card scheme. The degree to which Interac will be interoperable with the Real-Time Rail (RTR, the account-to-account instant payment system) is not completely clear as of now. Interac's e-Transfer service posts to the recipient's account in under five seconds.

Interac e-Transfer allows for P2P payments using an alias. This had over 20M users as of 2018 (more than half the Canadian adult population), and in October 2020 processed more than 70 million transactions, nearly 1 payment per week per user. Interac's e-Transfer service has expanded beyond consumer-based use cases, though the degree of usage is not clear.

The RTR is being launched in 2023. Interac was selected as the vendor for the messaging and exchange layers by Payments Canada.

Key Facts & Figures

Population (in millions, 2020)	38.03m
Markets where service is active	Canada
Currency	Canadian Dollar (CAD)
Year service went live	1984
Number of users (2021)	30m+
Number of merchants onboarded	500,000+
Transaction values	CAD 0.01-3,000 in 24 hours and 10,000 in seven days
Payment rails enabled	Real-time A2A

Sources: https://modernization.payments.ca/the-benefits/; https://www.interac.ca/wp-content/uploads/2022/02/Interac-Corporate-Year-in-Review-2021-1.pdf; https://www.interac.ca/en/content/business/why-2018-was-another-banner-year-for-interac-e-transfer/;https://www.interac.ca/en/content/inside-interac/2020-a-year-in-review-at-interac/

Connecting to Interac

How sending/receiving institutions connect to the directory

Only financial institutions can be connected to Interac. Other participants need bank sponsorship to connect to Interac.

How end users register to the directory

Consumers access Interac e-Transfer through a participating bank or credit union (e.g., mobile banking app or website).

Directory Set-Up, Maintenance, & Security

Types of aliases supported by the directory

- Mobile phone
- Email

Securing the directory

When sending a payment, the sending party sets a security question and answer that the recipient must answer before being able to receive the funds. Consumers can also sign up for Auto deposit and skip the need to answer a security question to receive a transfer. The directory is not searchable.

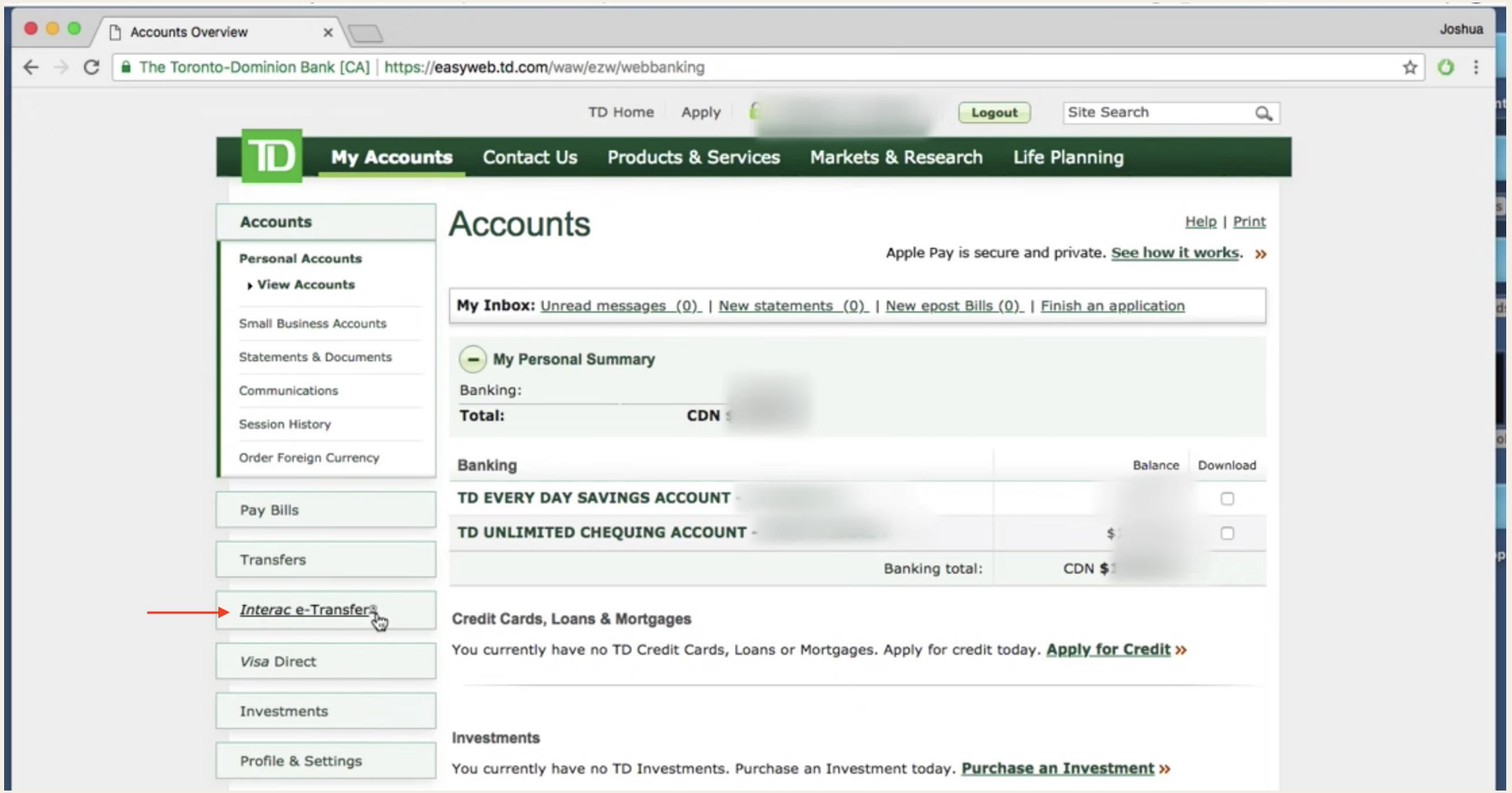
Ensuring the information in the directory is current

Participating financial institutions are responsible for maintaining accurate data.

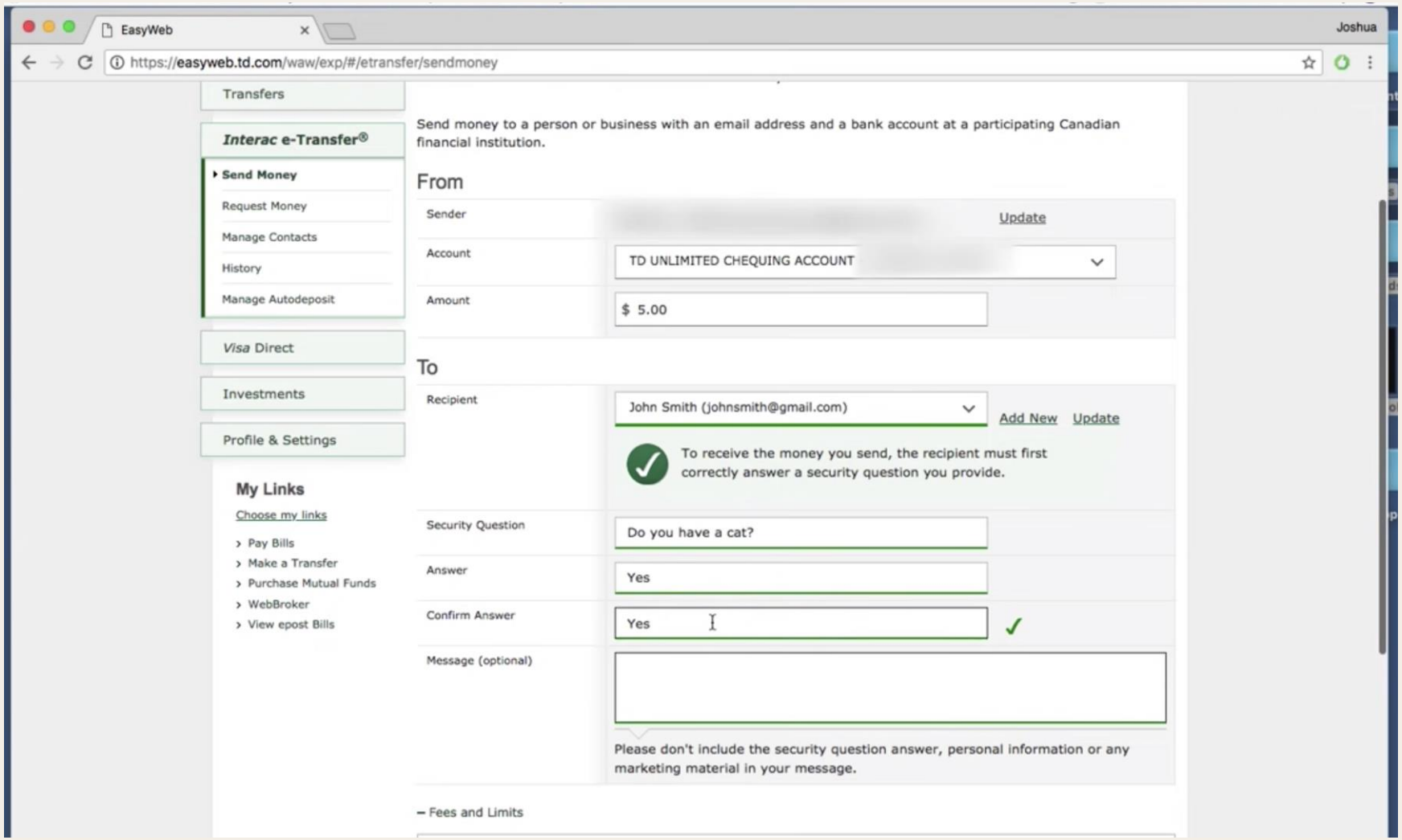
Is the directory open or closed?

Closed system: Only participating financial institutions can connect into Interac. Other clients require sponsorship by a participating financial institution. Interac's payment methods to connect to other payment rails (A2A or otherwise), such as Canada's bulk payment scheme. The degree to which the Interac network will be interoperable with the RTR is not clear.

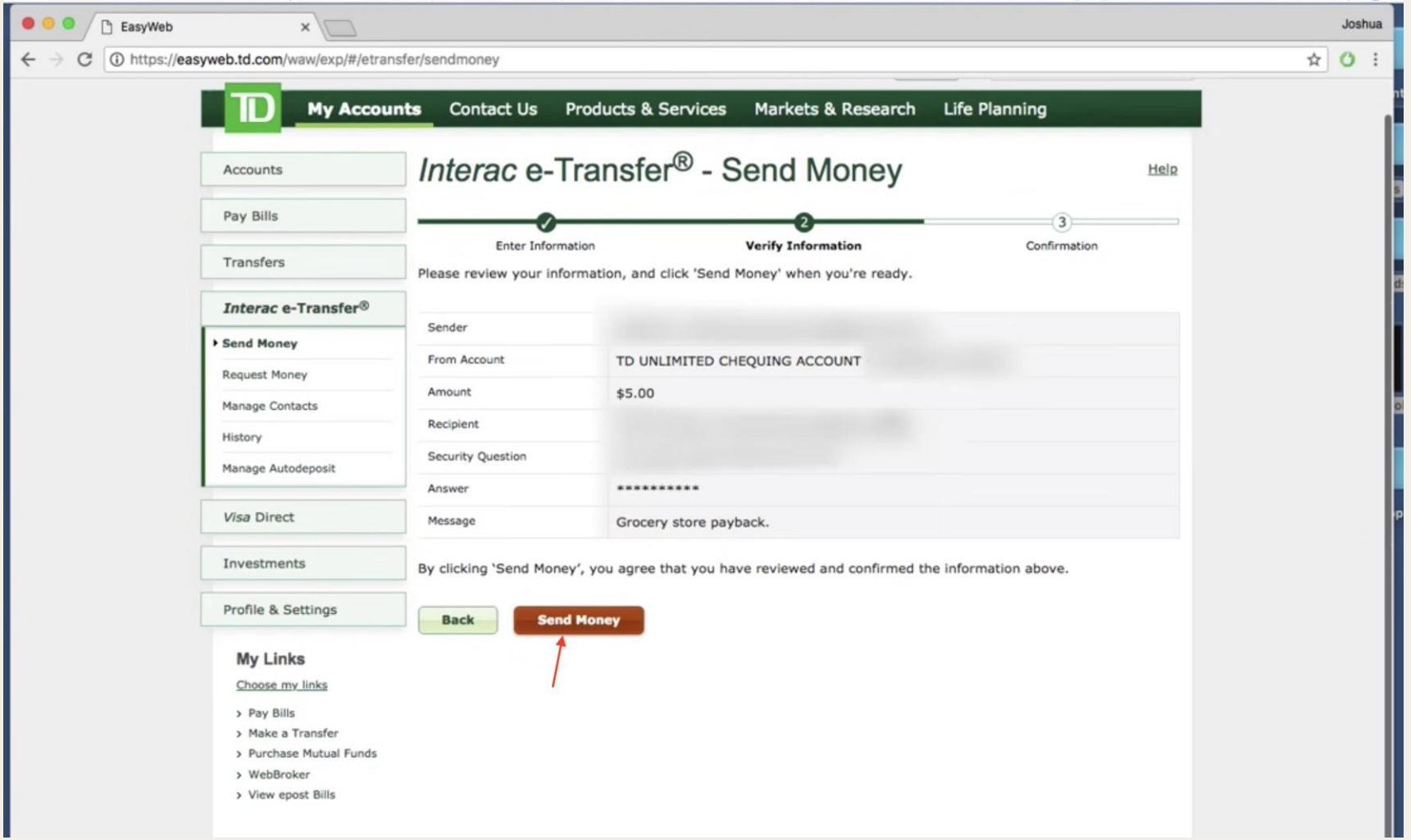
Sending User Experience – Access e-Transfer in Bank Website/App



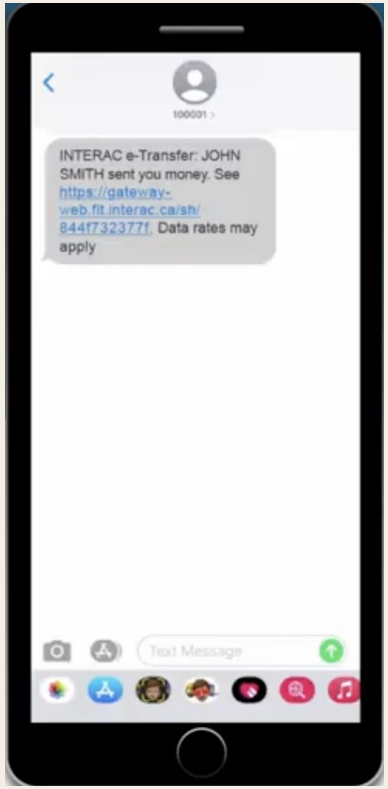
Sending User Experience – Enter Recipient Email/Phone & Add Security Question



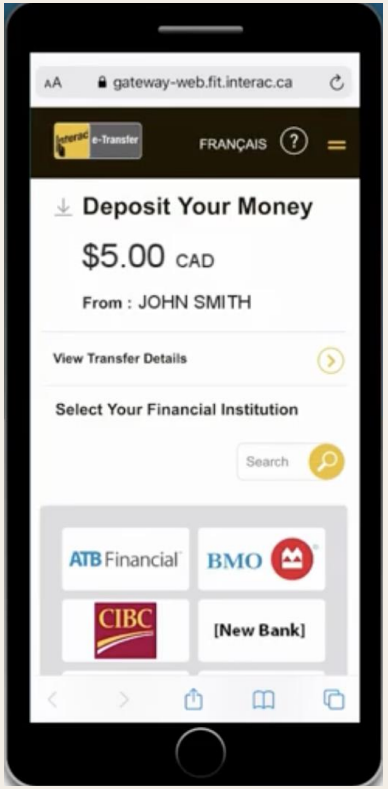
Sending User Experience – Confirm to Send Money



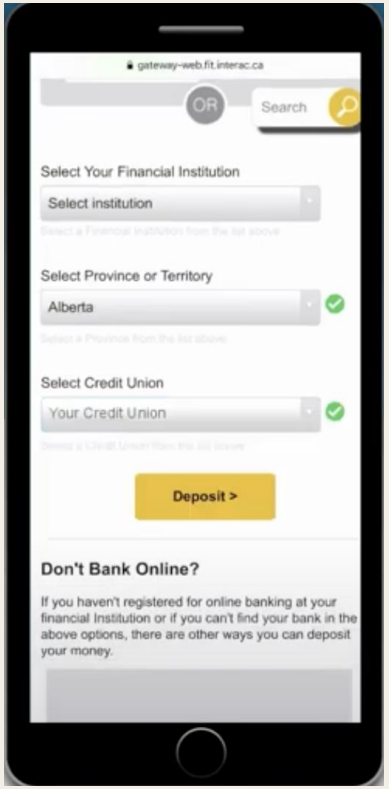
Recipient User Experience



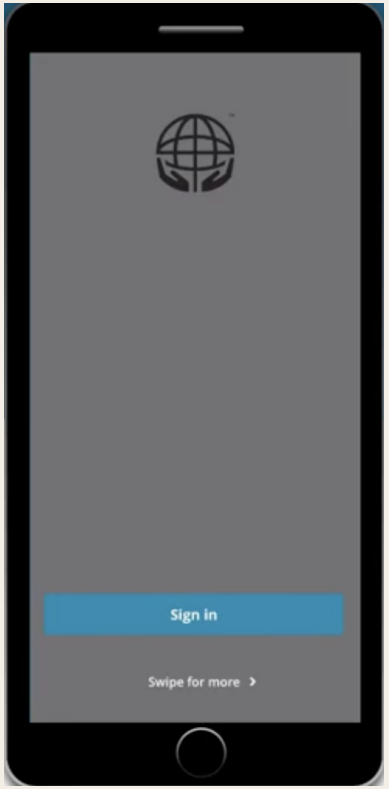
Recipient receives notification of e-Transfer



Recipient clicks link in text. Link opens

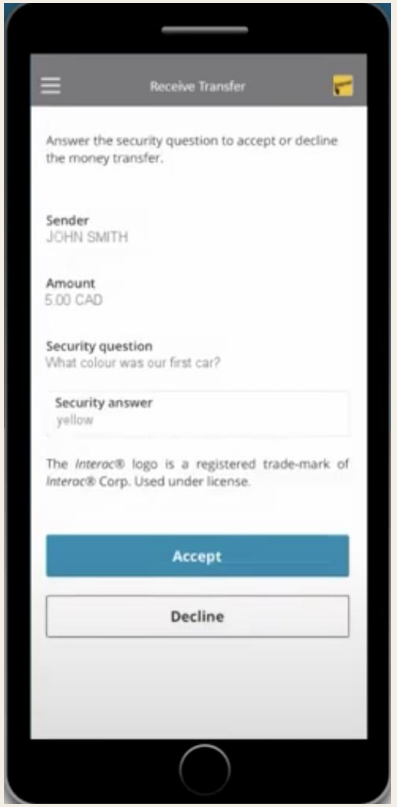


Recipient selects their bank

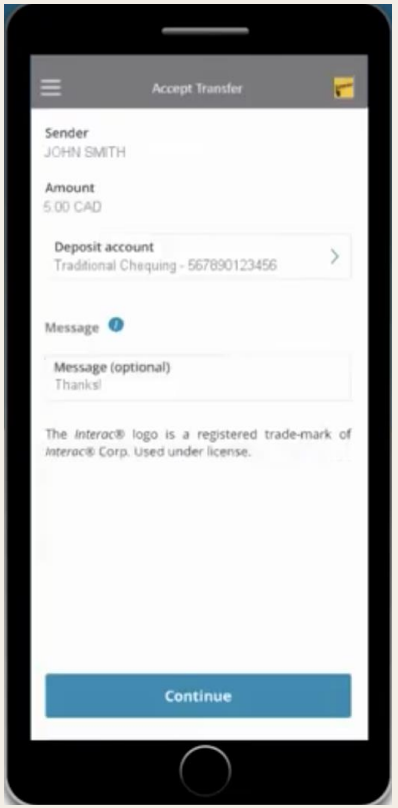


Log into bank

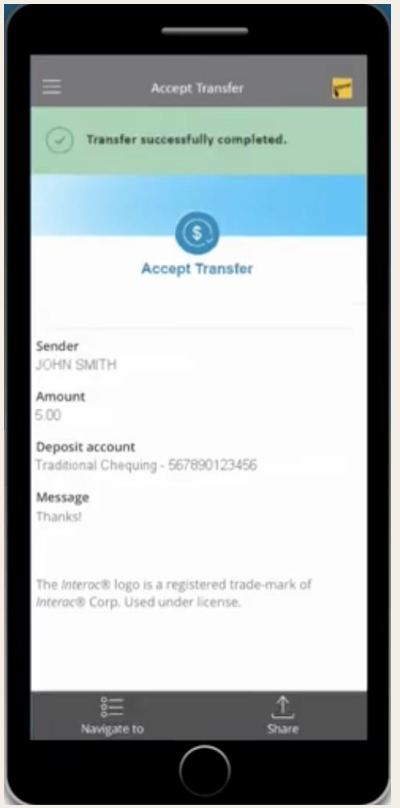
Recipient User Experience – Access e-Transfer in Bank Website/App



Recipient answers security question

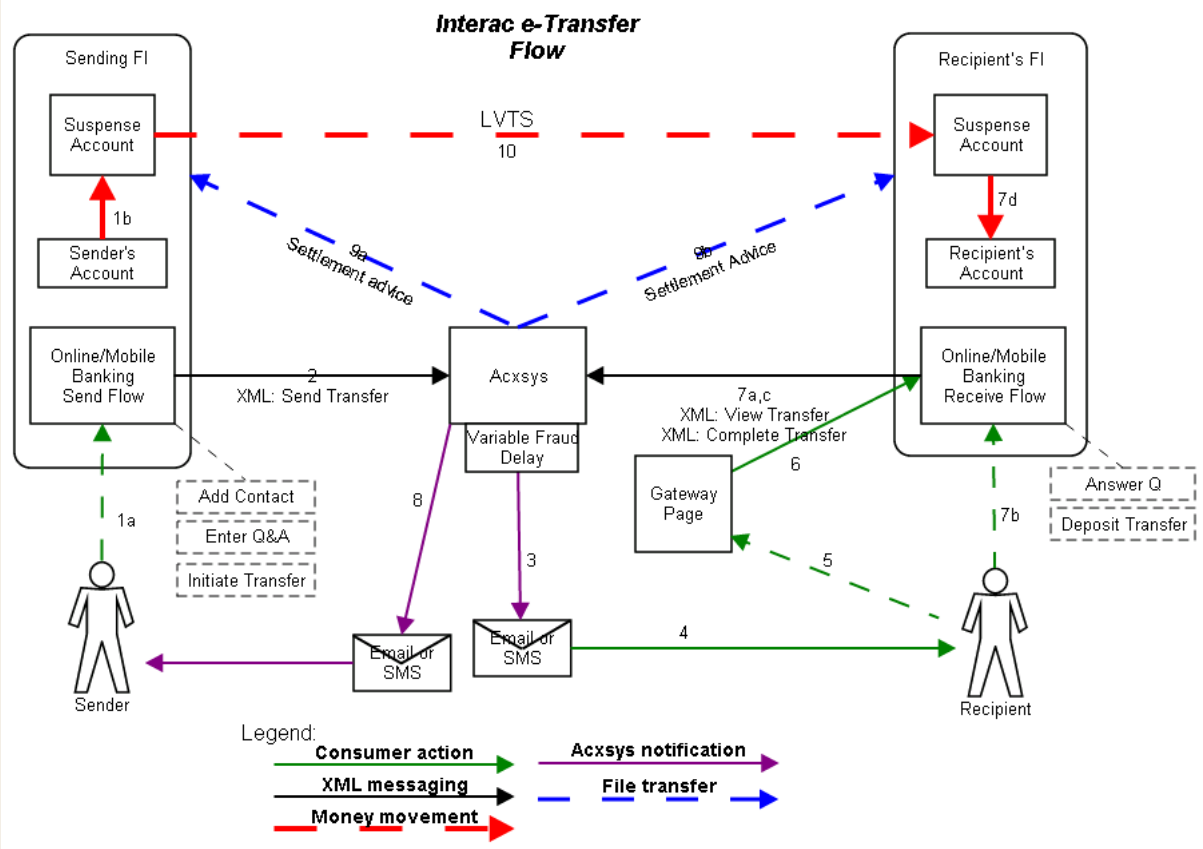


Confirm details



Transaction completed

Interac Transaction Flow



1a: Sender goes into online banking and sends a Transfer to the Recipient

1b: Sender's FI debits Sender's account

2: Sender's FI sends XML message to Interac

3,4: Interac sends the email or SMS notice with the reference number to the Recipient

5: Recipient clicks on the link in the email or SMS and goes to the Interac Gateway page

6: Recipient selects his/her FI and is redirected to online banking

7a: Recipient's FI queries Transfer details from Interac

7b: Recipient answers security question and chooses account to credit

7c: Recipient's FI sends XML to Interac to complete the Transfer

7d: Recipient's FI deposits the funds to Recipient's account

8: Interac sends the confirmation email or SMS notice to the Sender

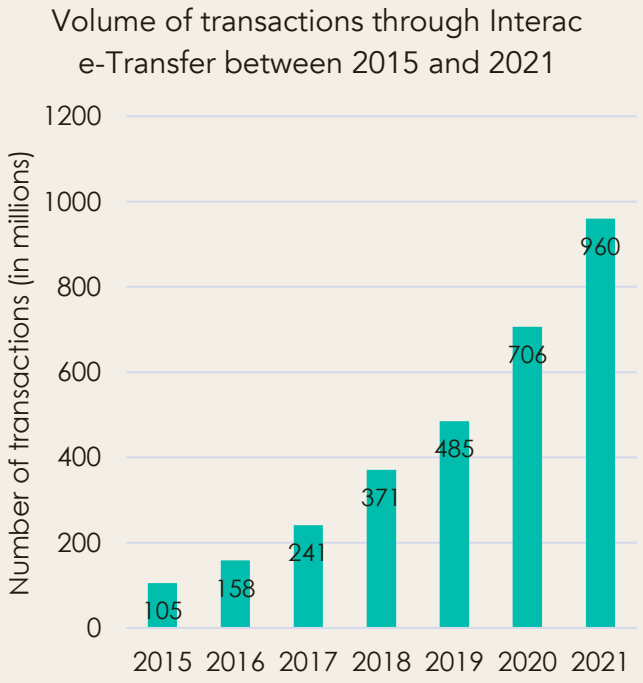
9a: Interac advises the Sender's FI to settle the funds with the Recipient's FI

9b: Interac advises the Recipient's FI to expect funds from the Sender's FI

10: Sender's FI forwards the funds to the Recipient's FI

Sources: https://developer.interac.ca/interac-e-transfer/

Lessons Learned for the U.S. Context



Comparing Canada and the U.S.

Both Canada and U.S. are very mature payment markets with high levels of electronification. The U.S. banking market is not as concentrated as the Canada market and has thousands of banks, The Canadian banking market has a few number of banks which comprise the large majority of the market.

The U.S. is more fragmented with multiple service providers for P2P services including wallets like PayPal / Venmo, Cash App, along with Zelle (owned by the major banks).

In contrast, Interac e-Transfer is the de facto solution for P2P services in Canada, though competing solutions such as PayPal exist.

Lessons learned for U.S. market

Acxsys Corporation was created in 1996 by eight financial institutions who built the Interac network to develop new business partnerships and services, including Interac e-Transfer. This has allowed Interac to have a dominant share due to the early mover advantage and cooperation among banks in a concentrated banking market.

In the U.S., there is no dominance in P2P by any single player. TCH banks RTP in 2017, but by that time, other P2P apps, such as Square Cash were already in the market. Therefore, there isn't a single dominant P2P service like Canada. The lesson of Interac demonstrates the advantage of repurposing existing networks, such as the ATM network, to innovate. This bypasses the issue of reach because all banked Canadians have access to an Interac debit card.

Conclusion

Going back to the 8 characteristics, Interac fulfills at least 7 (all but #3, supports multiple routes linked to payment alias). Interac is a closed-loop, so interoperability is limited in nature. This could change once the RTR goes live in 2023, though this is not yet clear.

Source: https://www.interac.ca/en/about/our-company/history/

Faster Payments Council: Directory Models Work Group

M-Pesa

M-Pesa

Summary of the System Profile

Instant Adoption as of 2020

High

Main Use Cases Supported by RTP

P2P	C2B e-commerce	C2B POS	B2B	B2C	G2C	G2B
●	●	●	●	●	○	○

Summary

M-Pesa is owned by Safaricom (Kenya) and Vodacom (Africa-wide) both mobile companies. "Pesa" is Swahili for money; the "M" stands for mobile. It started around purchasing, storing, and reselling "airtime" phone data or minutes. Was instrumental in driving financial inclusion for the unbanked in mostly rural parts of Kenya.

M-Pesa holds a dominant position in Kenya with a 99% market share of the mobile money market and had revenue in FY 21 82,647 (KShs Mn). Users can have a maximum account balance of KSHs. 300,000 (1,000 KSHs = €7.77. User can transact a maximum of KSHs. 300,000 per day, 150,000 per transaction. The minimum amount that can be sent is KSHs 1. Users cannot withdraw less than KSHs. 50 at an M-PESA agent outlet.

Key Facts & Figures

Kenya population (in millions, 2022)	55
Markets where service is active	7
Currency	Recipient receives funds in their country's currency
Year service went live	2007
Number of users (one-month active)	28.3m
Number of merchants onboarded	301k
Transaction values	KSHs 1 – 150,000
Transactions (2021)	15.2bn
Payment rails enabled	Real-time A2A
Number M-Pesa agents	247k

Sources: https://www.vodafone.com/sites/default/files/2020-10/Unlocking-Africa.pdf; https://www.researchgate.net/publication/349548752_A_Digital_Financial_Services_Revolution_in_Kenya_The_M-Pesa_Case_Study; https://docplayer.net/211105320-Safaricom-plc-results-booklet-for-the-year-ended-31-st-march-2021.html

Connecting to M-Pesa: FIs & End-Users

How sending/receiving institutions connect to the directory

Consumers, businesses, NGOs, and the government can connect to M-Pesa, though one must have a Safaricom cell phone number to connect to the system.

M-Pesa is a parallel payment system, so funds must go through M-Pesa rails. Interoperability between M-Pesa and banks has been done bilaterally and there isn't (yet) a universal/across the board, or mandated interoperability platform for bank-to-wallet in the country. That said, nearly every bank has a relationship with M-Pesa due to the latter's market dominance not only in Kenya, but also across sub-Saharan Africa.

How end users register to the directory

M-Pesa has an extensive network of agents across the continent (Majority of them in Kenya). To use M-Pesa, a user needs the following:

- A Safaricom cell phone number
- An ID (Passport or national ID)
- Physical presence at an agent (see pg. 29 for definition)

After registration, the user will need to set up their own PIN which they'll use every time they make a transaction or view balance. M-Pesa has a super app, where a user can carry out all necessary transactions, including bill payments, international transfers, etc.

Sources: https://www.vodafone.com/sites/default/files/2020-10/Unlocking-Africa.pdf;
https://www.researchgate.net/publication/349548752_A_Digital_Financial_Services_Revolution_in_Kenya_The_M-Pesa_Case_Study;
https://docplayer.net/211105320-Safaricom-plc-results-booklet-for-the-year-ended-31-st-march-2021.html

Directory Set-Up, Maintenance, & Security

The roles of sending/receiving FIs, merchants, NGOs, & other players

Types of aliases supported by the directory

- Mobile phone number only

Securing the directory

Data used to be stored in Germany until about 4 or 5 years ago when the data centers were moved to Kenya. Each user has a PIN that is used for verification. The directory cannot be mined for personal data.

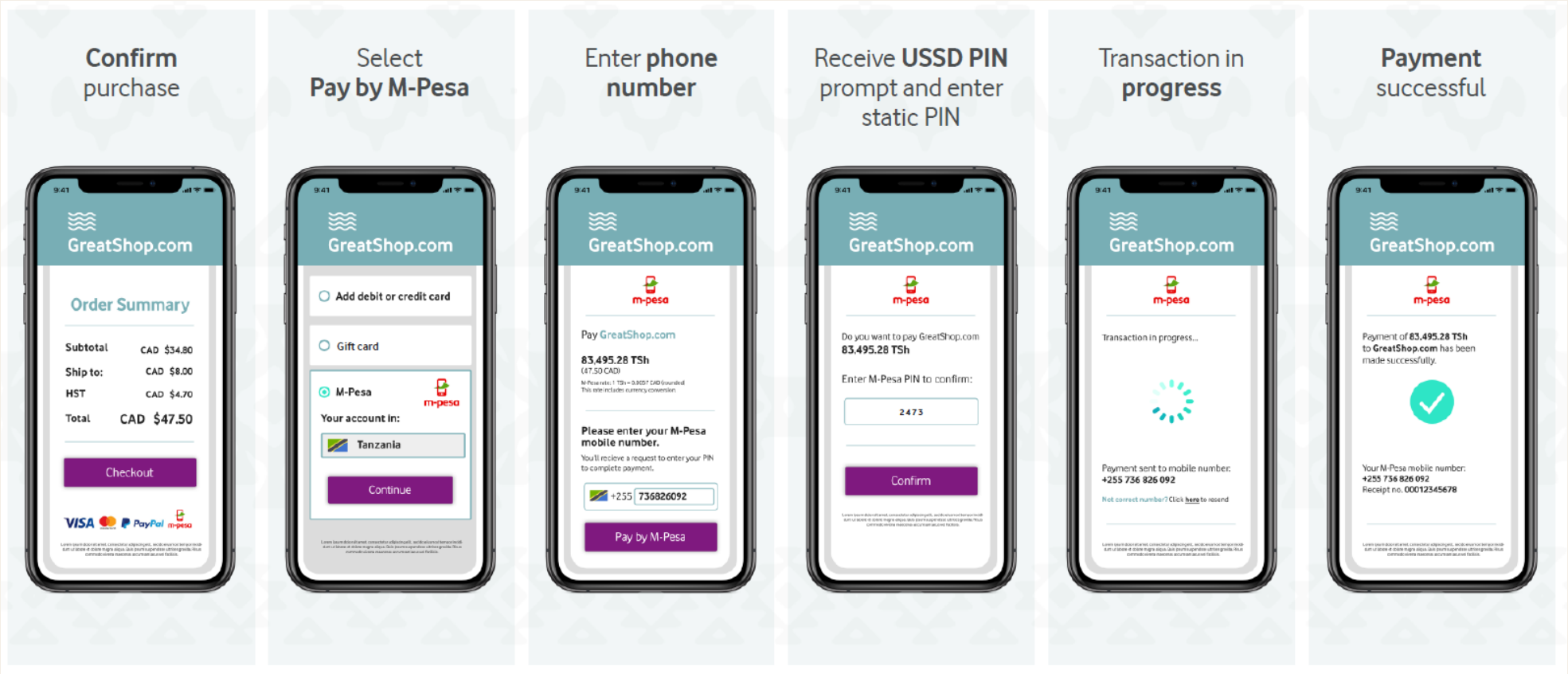
Ensuring the information in the directory is current

Is the directory open or closed?

M-Pesa used to be a closed system. The government of Kenya intervened after lobbying from other players (Airtel and Telkom Kenya). All financial institutions (including credit unions), Savings cooperatives (SACCOs), merchants, and governments can access the directory. Wallet-to-wallet interoperability is now mandated, but it's only possible via USSD.

Sources: https://www.vodafone.com/sites/default/files/2020-10/Unlocking-Africa.pdf;
https://www.researchgate.net/publication/349548752_A_Digital_Financial_Services_Revolution_in_Kenya_The_M-Pesa_Case_Study;
https://docplayer.net/211105320-Safaricom-plc-results-booklet-for-the-year-ended-31-st-march-2021.html

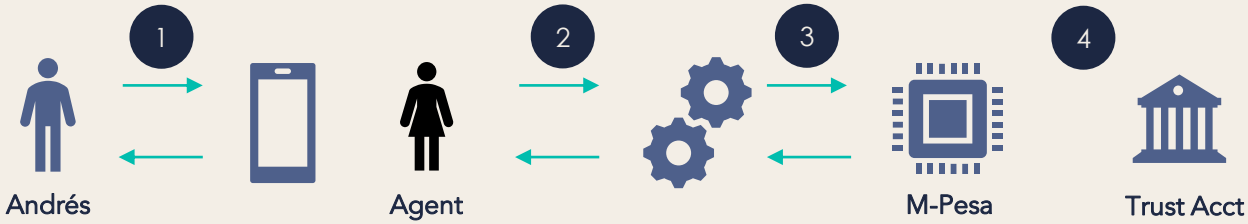
User Experience (C2B)



Sources: https://www.vodafone.com/sites/default/files/2020-10/Unlocking-Africa.pdf;
https://www.researchgate.net/publication/349548752_A_Digital_Financial_Services_Revolution_in_Kenya_The_M-Pesa_Case_Study;
https://docplayer.net/211105320-Safaricom-plc-results-booklet-for-the-year-ended-31-st-march-2021.html

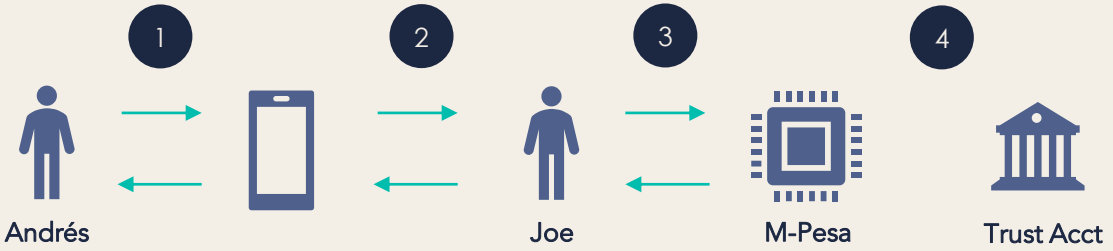
M-Pesa Transaction Flow

M-Pesa Loading Money & P2P transfer



Transaction flow: P2P

Andrés wants to load money onto the M-Pesa account. (1) Andrés works with an M-Pesa Agent and provides them his mobile phone number and the cash he would like loaded onto the M-Pesa account. (2) The agent then takes the money and through the M-Pesa network credits Andrés' account. (3) M-Pesa account for Andrés is now updated with the new account balance and SMS is sent to confirm the transaction(4) the money is held in a Trust account with M-Pesa's bank.



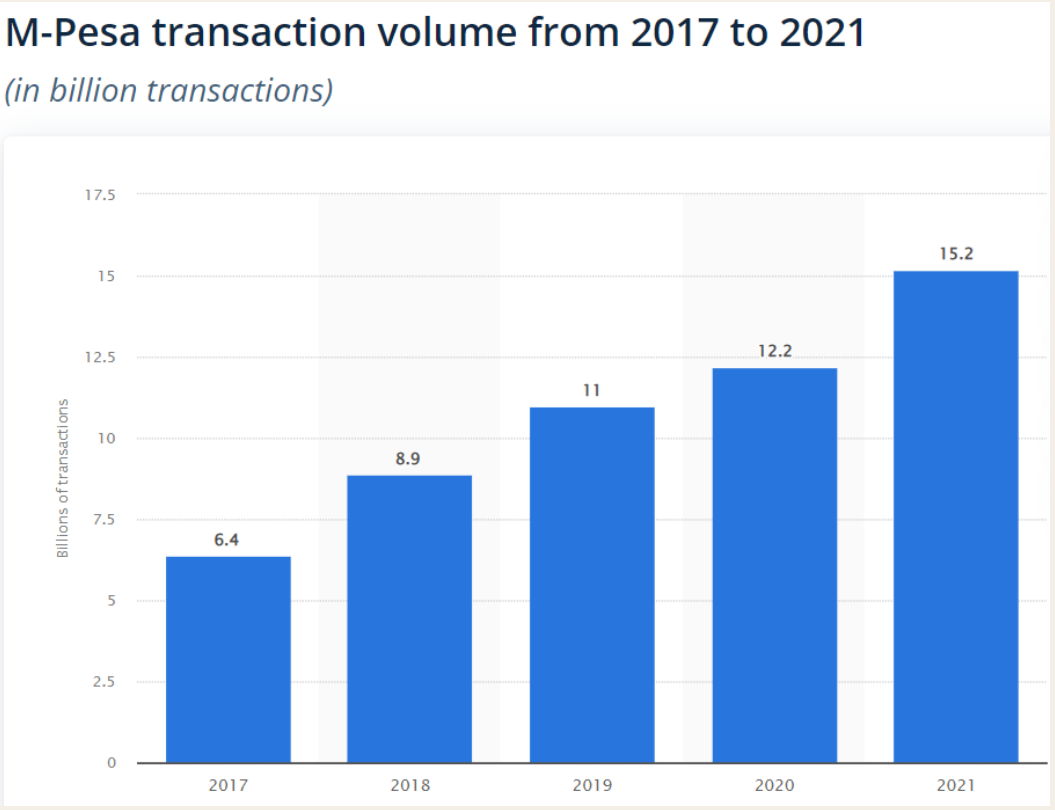
Transaction flow: P2P

Andrés wants to pay Joe back from lunch using his M-Pesa account. (1) Andrés goes to the Safaricom app and selects M-Pesa (2) Andrés selects Joe's number, enters the amount to send and his PIN. (3) M-Pesa then transfers the funds and sends Andrés and Joe SMS confirming the transactions (4) Andrés and Joe's account balances are updated

Sources: https://www.vodafone.com/sites/default/files/2020-10/Unlocking-Africa.pdf; https://www.researchgate.net/publication/349548752_A_Digital_Financial_Services_Revolution_in_Kenya_The_M-Pesa_Case_Study; https://docplayer.net/211105320-Safaricom-plc-results-booklet-for-the-year-ended-31-st-march-2021.html

Not all message flows are displayed for the sake of clarity

Lessons Learned for the U.S. Context



Sources: Statista 2022 https://www.statista.com/statistics/1139181/m-pesa-transaction-volume/#:~:text=Transaction%20volume%20of%20M-Pesa%20%E2%80%93%20one%20of%20the,in%20the%20financial%20year%20ending%2031%20March%202022.

Comparing Kenya and the U.S.

Kenya has a much higher unbanked population than the U.S. Safaricom has significant market share and that along with first-mover advantage M-Pesa was able to establish a dominant position in the market and meet a specific need for the unbanked.

The U.S. is more fragmented with multiple service providers for P2P services including wallets like PayPal / Venmo, Cash App, along with Zelle (owned by the major banks).

Lessons learned for U.S. market

Both M-Pesa and the U.S. P2P services tend to be closed-loops that leverage their own directory and money movement capabilities. Partnerships with Banks and Fintechs provide consumers with more flexibility and options to extend beyond P2P to other use cases. Interoperability is achieved through strong partnerships with banks, fintechs, and other networks.

Conclusion

M-Pesa is a closed-loop with an associated directory, but through partnerships multiple use cases can be supported with consumers and businesses realizing significant benefits. M-Pesa does operate a directory that adheres to our three fundamental attributes including safety, interoperability, and governance. It does only support one alias (mobile phone #). M-Pesa is a classic mobile wallet and does not utilize traditional bank accounts as a funding source like other solutions investigated during this project.

M-Pesa

Additional Background

Smart Lifestyle Channels	
M-PESA App	The M-PESA App which is in the piloting stage will deliver the suite of M-PESA solutions to our consumers in a customer centric approach through the Consumer App. This will redesign M-PESA journey to reduce demand in Call Centre and simplify multiple payments. It will serve as a one stop shop for all SMEs needs including instant Lipa Na M-PESA sign up through the Merchant App, increased access to market to achieve scale through SME Marketplace and integration of third party services through Mini Apps.
M-PESA Business/ Merchants Transacting Till (Buy Goods)	The M-PESA Business till is an enhancement of the existing Lipa Na M-PESA Buy Goods till that enables business owners to collect payments on the till and use the money collected to make other transactions directly from their till. The M-PESA for Business till is ideal for businesses in retail, such as supermarkets, restaurants, hardware, pharmacies, boutiques, salons etc. that collect money from customers regularly as part of their business. The product can be accessed via USSD *234*2# or via app M-PESA for Business App.
M-PESA Business App	M-PESA for Business App allows merchants and businesses to better visualize their payment collections and spend, see full statements and transact directly from their M-PESA Business till using the App. The App provides users a faster and simpler payment experience. Its an alternative to the USSD service *234# Option 2.
M-PESA Bill Manager	This is a service that allows customers to save and pay bills in one transaction, memorizing all paybills and account numbers and better still, a way for them to be reminded of the bill payment due dates. The service is available to all M-PESA registered customers and can be accessed by dialling *234# then selecting M-PESA Products followed by Bill Manager.
Pochi la Biashara	Pochi La Biashara, translated to 'Business Wallet' in English, is a product allows M-PESA registered customers who own informal businesses such as; food vendors, kiosk owners, boda-boda operators, second hand clothes dealers, etc. to receive and separate business funds from personal funds on their M-PESA line.

Sources: https://www.vodafone.com/sites/default/files/2020-10/Unlocking-Africa.pdf;
https://www.researchgate.net/publication/349548752_A_Digital_Financial_Services_Revolution_in_Kenya_The_M-Pesa_Case_Study;
https://docplayer.net/211105320-Safaricom-plc-results-booklet-for-the-year-ended-31-st-march-2021.html

M-Pesa

Item	Description
Transfers/P2P/W2W	This represents customer deposits in the M-PESA e-wallet that can be funded by direct cash deposits at agent level or through person to person (P2P) transfers.
M-PESA Agents	M-PESA Agents include Safaricom authorized dealers, operating one or more outlets around Kenya, retailers with a substantial distribution network like petrol stations, distributors, supermarkets, registered SMEs and selected Banks and Micro-Finance Institutions. Their key tasks include; registering M-PESA customers, depositing cash into registered customers' M-PESA wallets, processing cash withdrawals for registered and non-registered M-PESA customers and compliance with Safaricom AML & KYC Policy and business practices.
Withdrawals/Cash out	Withdrawal is the removal of e-money from M-PESA e-wallet to cash through M-PESA agents.
Deposits/Cash in	Customers fund their M-PESA e-wallet through M-PESA agents or directly from their bank accounts through a short code.
Payments	
C2B/W2B, B2C/B2W and B2B.	Customer to Business (C2B) or Business to Customer (B2C) are mainly bank transfers while Business to Business (B2B) is for business transactions. These together with LNM and revenue from betting transactions form the payments channels in the M-PESA ecosystem.
Lipa Na M-PESA (LNM)	LNM is a platform that enables merchants to transact using a till number to collect payments from customers. LNM has two major use cases; • Buy Goods - mainly used for one-off payments to merchants, this is done 'on the go', mainly face to face but can also be done remotely. • Billers - This is the paybill option/C2B of LNM which mostly happens remotely/online and is mainly used for repetitive transactions done on utility payments to government agencies, SACCOs, electricity & water providers and hospitals.

Sources: https://www.vodafone.com/sites/default/files/2020-10/Unlocking-Africa.pdf;
https://www.researchgate.net/publication/349548752_A_Digital_Financial_Services_Revolution_in_Kenya_The_M-Pesa_Case_Study;
https://docplayer.net/211105320-Safaricom-plc-results-booklet-for-the-year-ended-31-st-march-2021.html

M-Pesa

Additional Background

Savings and Lending	
M-Shwari	M-Shwari is a micro-lending/savings product in partnership with NCBA (a tier 1 Kenyan Bank). The M-Shwari Loan Account is a micro-credit product which allows customers to borrow money or to complement their savings towards an investment or enterprise. The M-Shwari Deposit Account is a micro-savings product which allows customers to securely store their money for a specific purpose or for unexpected events.
KCB-M-PESA	KCB M-PESA is a savings and loan service in partnership with KCB Bank (a tier 1 Kenyan bank) that enables M-PESA customers to save as little as KShs 1, and access credit from KShs 1,000. The KCB M-PESA loan account is a micro-credit product which gives customers access to loans for an emergency or to fund a project or an enterprise.
Fuliza	In partnership with Kenyan lenders, NCBA and KCB Bank, the Group operates an Overdraft (OD) facility dubbed 'Fuliza', a product that enables customers to access unsecured line of credit by overdrawing on M-PESA to cover short-term cash-flow shortfalls subject to an applicable pre-determined limit. Fuliza is available to all M-PESA customers, however the awarding of limits will depend on the customer's credit scoring and how long they have been using M-PESA. Customers who 'opt in' on Fuliza are charged a one-off access fee and daily maintenance fees on unpaid loan amounts based on a pre-determined matrix.
M-Kesho	In partnership with Equity Bank, M-Kesho Bank Account was launched to enable Safaricom's mobile money clients to directly access their Equity bank accounts. Registration is free and the account has no charges, ledger fees nor minimum account balance requirement.
M-Kopa	M-KOPA provides solar home systems that innovatively integrate machine-to-machine technology (M2M) with a micro-payment solution. The system includes embedded GSM technology for monitoring and metering usage, while its pay-as-you-go service carries the advantage of no large initial cash outlay. After an initial deposit, customers pay daily instalments via a mobile money service (M-PESA) until paying off the balance. Once this repayment is complete, customers own the unit outright. Importantly, this solution is cheaper and healthier than the alternative, kerosene lamps for rural households with no electricity. M-KOPA solar is currently available in 750 outlets nationwide in Kenya through the Safaricom distribution network.

Sources: https://www.vodafone.com/sites/default/files/2020-10/Unlocking-Africa.pdf; https://www.researchgate.net/publication/349548752_A_Digital_Financial_Services_Revolution_in_Kenya_The_M-Pesa_Case_Study; https://docplayer.net/211105320-Safaricom-plc-results-booklet-for-the-year-ended-31-st-march-2021.html

M-Pesa

Additional Background

IMT	
International Money Transfer (IMT)	**M-PESA Global** Safaricom Plc through its fully owned subsidiary, Safaricom Money Transfer Services Limited (SMTSL), operates remittance services that allows customers to send and receive money to a beneficiary through registered mobile phone numbers in partnership with third party International Money Remittance (IMT) providers. Revenue is earned from transaction fees charged to customers for international money transfers (inbound and outbound). M-PESA global enables M-PESA registered customers to send and receive money: 1. To East Africa: Rwanda, Tanzania & Uganda. 2. Globally: To millions of Bank accounts and over 500,000 Western Union locations globally. 3. Through PayPal: Access funds quickly and shop around the world with PayPal mobile money service with M-PESA.
AliPay Partnership	Safaricom partnered with AliPay to integrate M-PESA as a payment method on AliExpress e-commerce.
E-Commerce	
Paypal Partnership	Safaricom, PayPal and TransferTo announced a collaboration on 9 April 2018 for a new service that allows movement of funds between M-PESA and PayPal accounts. Qualifying M-PESA customers in Kenya can link their PayPal accounts to their M-PESA wallets, enabling them to easily and securely buy goods and services from merchants around the globe.

Sources: https://www.vodafone.com/sites/default/files/2020-10/Unlocking-Africa.pdf;
https://www.researchgate.net/publication/349548752_A_Digital_Financial_Services_Revolution_in_Kenya_The_M-Pesa_Case_Study;
https://docplayer.net/211105320-Safaricom-plc-results-booklet-for-the-year-ended-31-st-march-2021.html

Faster Payments Council: Directory Models Work Group

Pix

Pix

Summary of the System Profile

Instant Adoption as of 2021

Main Use Cases Supported by Pix

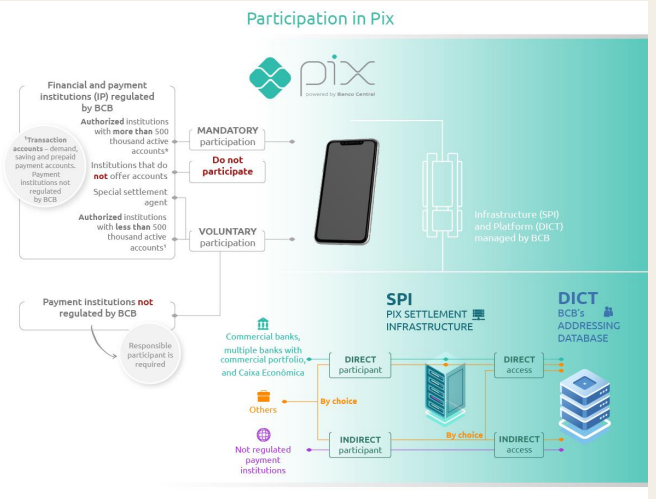
Summary

- Pix is the combination of an instant payments rail (SPI) and a directory capability (DICT). These systems are owned and operated by Banco Central do Brasil (BCB, the Brazilian Central Bank). SPI fits the BIS definition of instant payments – near real time, credit push, 24x7x365, irrevocable
- BCB mandated participation in Pix for all institutions with more than 500,000 accounts.
- BCB created and govern rules for Pix – e.g., participation rules, operating rules, user experience rules, etc.
- Pix is widely available to individuals, businesses and government entities in Brazil. Pix has very high adoption for a wide range of use cases. Pix is accessed through any of over 775 "Participants" in the scheme. Direct Participants (~115) are directly connected to SPI and DICT. Indirect Participants (~660) access SPI/DICT via Direct Participants.
- Individuals access Pix through their bank or payment institution. Aliases include phone number, email address, tax ID and randomly generated UUID. QR codes are also leveraged to support transactions.
- Merchants can accept Pix for C2B payments via QR Code, payment link, or via a PSP. Pix is available online or in person.
- Payments made via Pix are processed over the SPI real-time payments network or "on us". Over half of the population and 9 million businesses are active on Pix.

Source: https://www.bcb.gov.br/en/financialstability/pixstatistics

Key Facts & Figures

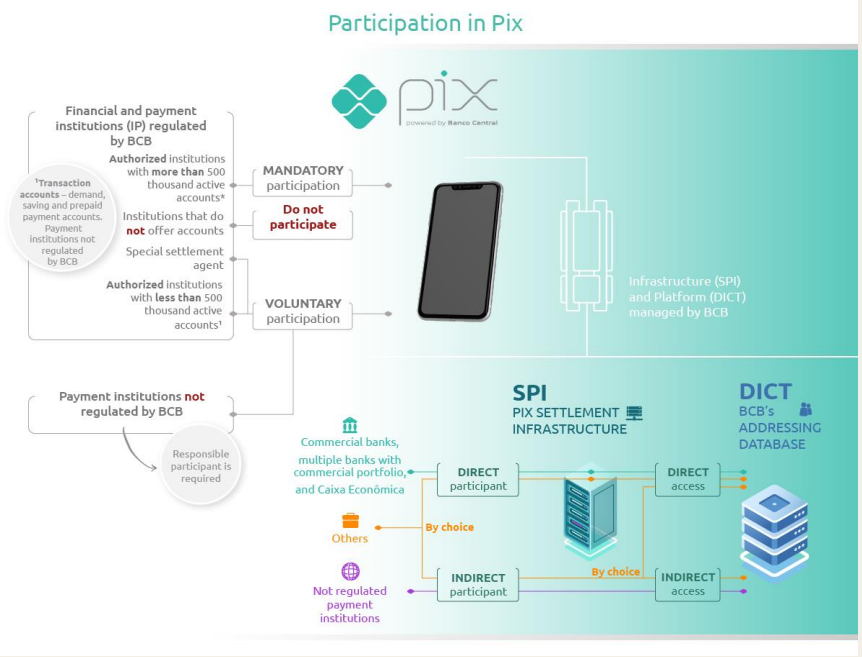
Population (in millions, 2020)	215.6
Markets where service is active	Brazil
Currency	Real (BRL)
Year service went live	2020
Number of users (2022)	129M
Number of merchants onboarded	75% of online
Transaction values	Variable
Payment rails enabled	SPI



Connecting to Pix: FIs & End-Users

How sending/receiving institutions connect to the directory

- Institutions which participate in Pix are called Participants
  - Direct Participants are entities (generally banks) that can directly settle under the SPI instant payment scheme
  - Indirect Participants are entities (which must be regulated as of 2023) who can access Pix but must work with a Direct Participant to settle SPI payments
- Pix Participant connect to Pix via the BCB operated infrastructure
- Customers access Pix via Participants



How end users register to the directory

- All customers (consumer, commercial or government) enroll for an alias in the directory (DICT) via their Participant provider
- Consumers will generally register through the app from their bank or Payments Initiation provider
  - Each alias must be registered based on the user's request. The FI that holds the account to be related to a new alias must ensure that the alias belongs to the user that requested the new entry.
  - In addition to the registration process, the user may also:
    - Remove the alias from the Directory;
    - Request the migration of one alias linked to one account in a particular FI to another account held in a different FI;
    - Claim the possession of one alias that is already in use;
    - Migration and disputes (in case someone's claim the possession of a particular alias) have specific controls to ensure the accuracy of the operation.
- Businesses and governmental entities will work with their provider to enroll and manage aliases

Sources: https://www.bcb.gov.br/en/financialstability/pixstatistics

Directory Set-Up, Maintenance, & Security

The roles of sending/receiving FIs, merchants, and other players

Types of aliases supported by the directory

- Pix supports 4 alias types:
  - Phone number
  - Email address
  - Tax identifier (CNPJ, CPF)
  - Randomly generated alias (UUID)
- Individuals can have up to 5 aliases; businesses up to 20 aliases
- Each alias points to only one account

Securing the directory

- BCB owns and operates the directory and is primarily responsible for securing the central operation of the directory
- Participants are responsible for protecting information about their customers
- Account data is stored with Pix Participants.

Ensuring the information in the directory is current

- Customers (consumers and businesses) work with their Pix Participant provider to enroll an alias; Participant is responsible for properly authenticating customer and validating related accounts
- Customers can add/delete/transfer aliases

Is the directory open or closed?

- Who can access the directory?
  - Direct and Indirect Pix Participants
- Is the directory searchable?
  - No
- What data is exposed by the directory?
  - Name, tax ID (obfuscated), bank (routing number equivalent), bank account
  - Fraud indicators (participant submitted indicators of fraud against the alias)

Sources: https://www.bcb.gov.br/en/financialstability/pixstatistics

Pix Transaction Flow

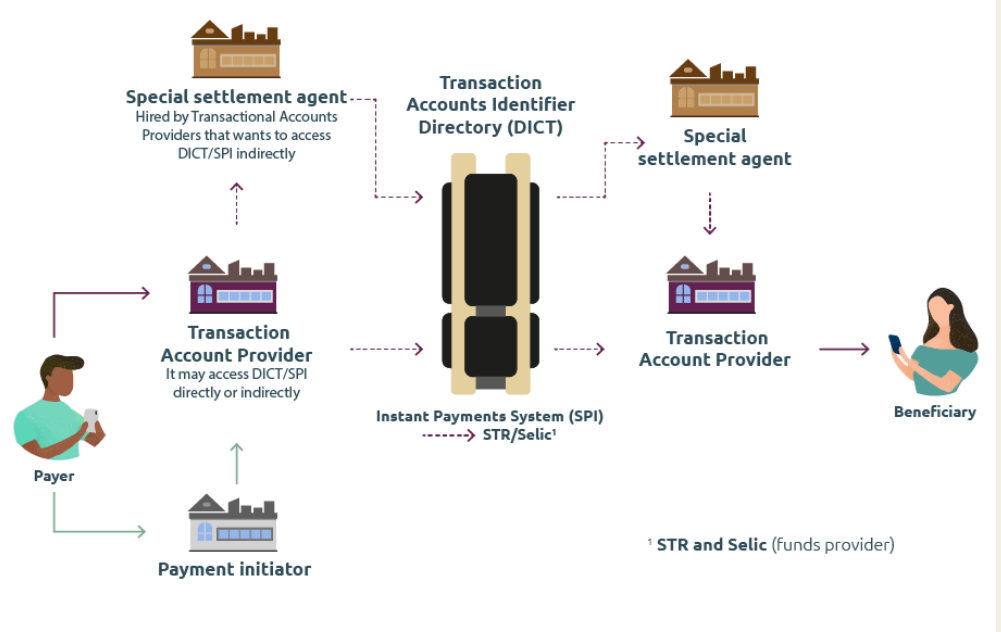
All transactions have similar message flows

Transaction flow: P2P

1. Payer wants to pay Beneficiary
2. Payer authenticates to their bank or payment initiation provider.
3. Payer enters alias for Beneficiary and payment details; Pix displays Beneficiary name and bank as confirmation
4. Payer approves payment
5. Pix Participant processes payment instruction
   a. If a Direct Participant, payments are instantly settled via SPI (or "on us")
   b. If an Indirect Participant, Indirect Participant works with Direct Participant provider to settle payments via SPI
6. The sending and receiving parties are notified of the transaction

NOTE: The Pix payment experience is controlled through operating rules to ensure the experience is similar regardless of the Participant used by the customer.

Paying with Pix



Source: https://www.bcb.gov.br/en/financialstability/pixstatistics

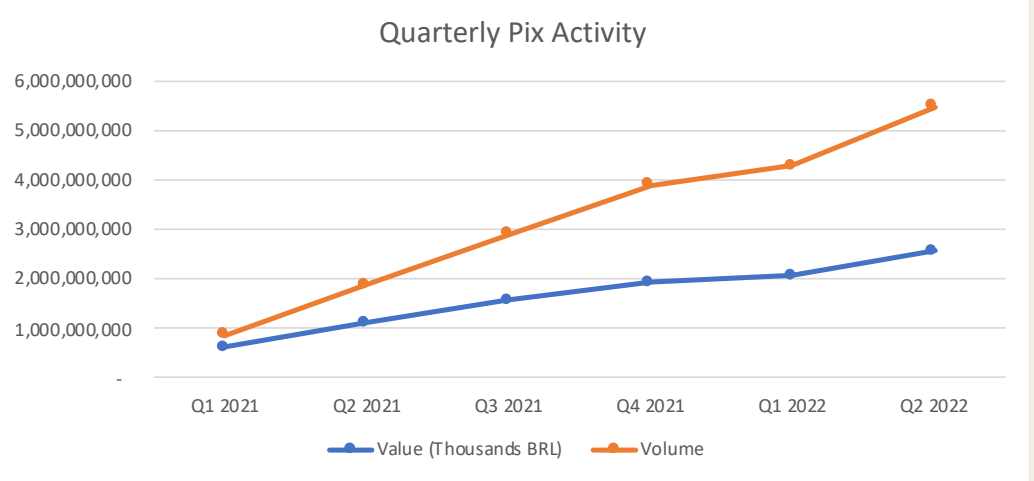
Using Pix

Color Commentary

- Pix brings the instant payment scheme and the directory under common ownership (BCB), operation and governance. This reduces any form of conflict in directory adoption.
- A two-tiered participation model (Direct Participants and Indirect Participants) has created an efficient way for smaller institutions to offer Pix and increased the speed of adoption and availability.
  - The Payment Initiator type of institution is unique to Brazil and the inclusion of Payment Initiators as Participants in the Pix scheme has made Pix more ubiquitously available.
- A robust implementation of QR Code capabilities (along with a companion smart link for when a QR Code cannot be scanned) has created a viable means for including payment related data in a payment request. This supports POS and ecommerce transactions, but also makes many types of business payments easier.
- BCB has mandated that a certain number of P2P transactions shall be free to the consumer each month. In practice, competition among participants has made P2P generally free for consumers. Pix Participants can charge business entities for all types of business-related Pix transactions.

Pix in Brazil by the numbers

- Transaction Volume (2021): 9,546 million
- Transaction Value (2021): BRL 5,222 million
- Transaction share (2021): >20%
- Average value per Pix transaction: BRL 552
- Number of active alias entries: 130,648,328 (June 2022)



Source: https://www.bcb.gov.br/en/financialstability/pixstatistics

Lessons Learned for the U.S. Context

Comparing Brazil and the U.S.

Brazil, like the U.S., has many different forms of financial institution (banks, credit societies, etc.) Brazil also has a class of providers called Payments Initiators which are regulated. The total number of regulated entities in Brazil is still far less than in the U.S. (a few hundred rather than thousands. The Brazilian banking sector is more concentrated than int the U.S., with the top 5 Brazilian financial institution holding approximately 80% of deposits.

Pix is owned and operated by the Brazilian Central Bank. SPI, the instant payments scheme, is akin to RTP or FedNow in the U.S. The central bank owned, and operated directory (DICT) has no equivalent in the U.S.

Lessons learned for U.S. market

Pix has been successful in accelerating the adoption of instant payments in large part due to a robust, broadly available directory capability. Customers (consumer and commercial) can have multiple aliases based on different data elements. The introduction of a randomly generated UUID alias has facilitated system generated payments (e.g., B2B.) Regulated financial institutions remain responsible for protecting customer data. QR Code capability has made point of sale/ecommerce payments ubiquitous. The QR Code capability has built in additional transactional information to make the end-to-end payment process "complete."

Conclusion

Pix provides capabilities to address the overarching characteristics of Interoperability, Safety and Governance. Pix supports most of the beneficial characteristics and provides a particular breadth of use case support. The native support in Pix for multiple aliases per person is unique and adds some interesting capabilities.

Source: https://www.bcb.gov.br/en/financialstability/pixstatistics

Faster Payments Council: Directory Models Work Group

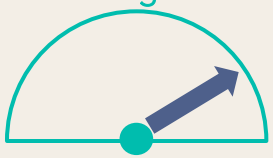
Swish

Swish

Summary of the System Profile

Instant adoption as of 2021

High



Main Use Cases Supported by Instant Payments

P2P	C2B e-commerce	C2B POS	B2B	B2C	G2C	G2B
●	●	●	○	●	○	○

Summary

- Swish is a money/movement service, owned by the largest banks in Sweden.
- Swedish citizens/consumers and merchants are the primary users of Swish, and high rates of penetration and scale have been achieved. Banks enable individuals and businesses to connect their bank account to their Swish account.
  - Individuals download the app on their mobile phone and can use Swish for P2P or C2B payments. Phone number is the primary alias leveraged. QR codes are also leveraged to support transactions. Swish does not charge consumers to make Swish payments.
  - Merchants can similarly leverage the app for supporting C2B payments. Online, POS, invoice, and B2C payouts are all supported. Swish posts a list of certified enablers/PSPs that can aid merchants with Swish integration and tech setup/support.
- Swish does not have a centralized directory of the end-user information; rather, the service relies on participating banks to provide routing/account information during transactions.
- Payments made via the Swish app are processed over the BiR real-time payments network in Sweden. Much of the population is active on Swish, though consumers have payment type choice with merchants, and card transactions still comprise a large percentage of in-store purchases. Overall, real-time payments comprise roughly 11 percent of payment volume in Sweden.

Key Facts & Figures

Population (in millions, 2020)	10.35m
Markets where service is active	Sweden
Currency	Krona (SEK)
Year service went live	2012
Number of users (2021)	8.1m
Number of merchants onboarded	306,000
Transaction values	SEK 1-variable
Payment rails enabled	Real-time A2A

Sources: https://www.swish.nu/; https://fasterpaymentscouncil.org/blog/6028/Prime-Time-for-Real-Time-2021; https://www.nsbanking.com/analysis/swish-payments-sweden/

Connecting to Swish: FIs & End-Users

How sending/receiving institutions connect to the directory

- Banks must connect to Swish open architecture in order to enable their customers to participate. The architecture and requirements are such that integration is not cost prohibitive for small institutions.
- The open architecture has also enabled third-party service providers to connect and support institutions and merchants with enablement needs.
- A developer portal, and API documentation is publicly available on the Swish website.
- Payments made via Swish ride the BiR rails, and as such, network connectivity and participation is also required.

How end users register to the directory

Consumers

1. Any citizen with a Swedish personal identification number (their version of an SSN), a mobile phone/number, and a bank account with a participating FI may register and participate. With over 80% of the total population using the system, Swish essentially has 100% consumer reach.
2. Download the BankID app, which is an app leveraged in Sweden for account opening, identity verification, authentication, and electronic signature; use the app to connect your Swedish personal identification number, bank account, and mobile phone number together to support the above activities. The app is used for very broad purposes (beyond just Swish).
3. Process any required activation, T&Cs, etc. within your mobile banking experience.
4. Download the Swish app, setup an account, and begin leveraging for payment/money movement.
5. There is not a Swish directory per se; rather the service relies on a federated model of matching IDs, to bank accounts/users, to Swish profiles/users. (banks store the data).

Merchants

1. Merchants partner with their financial institution in a similar way as the consumer process described above. Most merchants leverage a certified technical enabler to implement.

Sources: https://www.swish.nu/; https://fasterpaymentscouncil.org/blog/6028/Prime-Time-for-Real-Time-2021; https://www.nsbanking.com/analysis/swish-payments-sweden

Directory Set-Up, Maintenance, & Security

The roles of sending/receiving FIs, merchants, & other players

Types of aliases supported by the directory

- Mobile phone number is the alias leveraged
- Personal identification numbers and bank account numbers are also leveraged behind the scenes to connect and authenticate users to Swish accounts by banks.

Securing the directory

- Who is responsible for securing the data against malicious attacks?
  - Participating Banks
- Where is the data stored?
  - Banks store all data, Swish can only link the phone number to the bank, not to a specific account. Swish does not have any liability in cases of fraud.

Ensuring the information in the directory is current

- While low level profile management is performed by users within the Swish app, the hygiene of directory-type info is conducted by the bank and user/customer. Users are responsible for updating their bank account with current cell info, as changes occur.
- Banks link the proxy (mobile phone number) to the account and then submit this to Swish. Swish links the BIC (Bank Identifier Code) to the phone number so it knows which bank to route the message.

Is the directory open or closed?

- Who can access the directory?
  - Under the aforementioned federated model, individual banks maintain and govern their own data directories.
- Is the directory searchable?
  - No
- What data is exposed by the directory?
  - No personal data is revealed, only bank name and full name of the receiving and sending parties
- If a user is a not a Swish participant, there is no registration process initiated, the attempting sender simply receives an error message if the payee is not found.

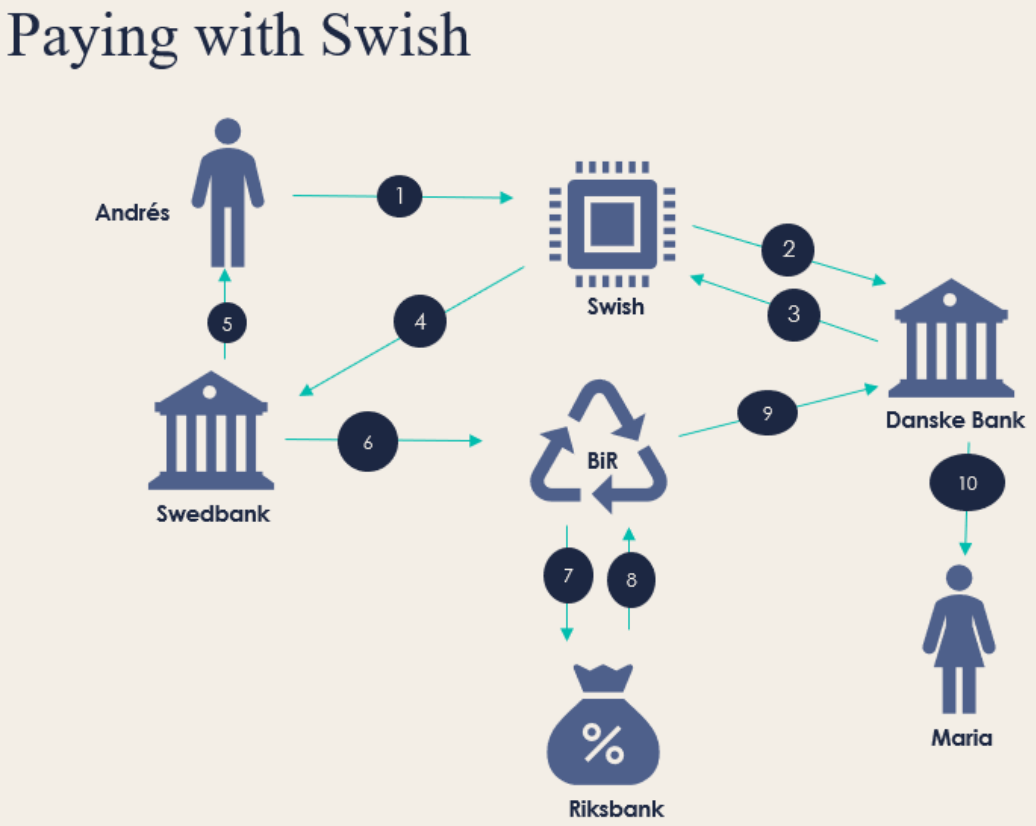
Sources: https://www.swish.nu/; https://fasterpaymentscouncil.org/blog/6028/Prime-Time-for-Real-Time-2021; https://www.nsbanking.com/analysis/swish-payments-sweden

Swish Transaction Flow

P2P & C2B transactions have very similar message flows, though acquirer involved

Transaction flow: P2P

Andrés wants to pay Maria back for lunch . (1) Andrés opens his Swish app on his mobile phone and leverages the money movement functionality. Andrés chooses Maria as the recipient from his phone's address book. (2) The Swish service identifies Maria as an active user by querying its database of users/cell numbers and sends a message to her bank to retrieve the account information stored at the bank. (3) After checking that the recipient is indeed who the payer wants to pay, the payer verifies his identify via the BankID app (4). BankID is connected to Swish, and the payer is automatically rerouted to the BankID app where he/she can verify their identity via thumbprint. After verification, Swish submits the payment information to the Bankgirot BiR system (5), which debits and credits the respective bank shadow accounts held at the Riksbank (the Swedish central bank) (6). The sending and receiving parties are notified of the transaction (7).



Sources: https://www.swish.nu/; https://fasterpaymentscouncil.org/blog/6028/Prime-Time-for-Real-Time-2021; https://www.nsbanking.com/analysis/swish-payments-sweden

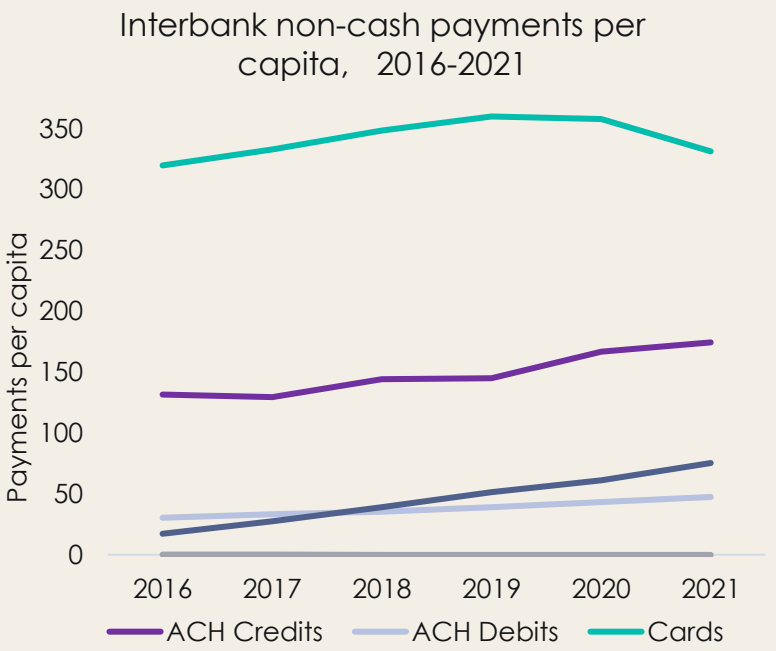
Using Swish

Color Commentary

- BiR, the instant payments network in Sweden, provides an open infrastructure through APIs, enabling banks and non-bank PSPs to access the network.
- BiR and Swish are available 24/7, 365
- Swish is owned and operated by the largest banks in Sweden, though also backed by the central bank
- In addition to early entry to market, the dual function of being able to leverage for money movement direct to bank accounts, and also for payment, have enabled Swish to scale quickly with high penetration rates
- The big banks in Sweden initially took action to thwart efforts by domestic telecom companies to produce and sell P2P services to citizens by building their own systems. Efforts were successful, and the Swish name now has ubiquitous consumer awareness, and is generally referred to as a verb. E.g., "Let me Swish you the funds." All BiR payments are initiated via the Swish platform.

Instant payments in Sweden by the numbers

- Transaction Volume (2020): 663m
- Transaction share (2020): 9%
- Projected CAGR: 16%



Sources: https://www.swish.nu/; https://fasterpaymentscouncil.org/blog/6028/Prime-Time-for-Real-Time-2021; https://www.nsbanking.com/analysis/swish-payments-sweden

Lessons Learned for the U.S. Context

Comparing Sweden and the U.S.

Sweden has a much more concentrated banking market than the U.S. (just over a hundred rather than thousands), though total assets are similarly concentrated in the largest financial institutions (four largest banks hold more than 80% of assets).

Swish is a bank-owned and bank-centric service, similar to Zelle in the U.S. Swish, however, benefitted from being an earlier entrant to the market (5 years earlier than Zelle), and as such, does not have any real competition in Sweden, particularly from a P2P perspective. Zelle on the other hand, has notable competition in the U.S. from firms like PayPal/Venmo, and the Cash app.

Lessons learned for U.S. market

The case of Swish demonstrates the utility of bank-backing for a directory. Outsourcing the operation of the directory of directories to a joint company owned by the backers enables a small group to concentrate on things like securing the directory, expanding beyond the P2P use case, onboarding merchants, and adding functionality to the core payment service. Furthermore, enabling the banks to be in charge of customer data limits the risk of having a centralized directory from a data protection perspective. An opportunity to be considered is in interoperability, as the closed network prohibits broad interoperability with other faster payments schemes and directories. Swish, as part of the European Mobile Payment Systems Association (EMPSA) is currently working on establishing interoperability with other European mobile payment systems, including Vipps in Norway, Mobile Pay in Denmark/Finland, and Twint in Switzerland.

Conclusion

Going back to the 8 characteristics, Swish fulfills at least 7 (all but #3, supports multiple routes linked to payment alias). Biggest consideration from an advantages perspective is the federated directory model, which enables Fis to locally maintain and secure sensitive account information. From an opportunity's perspective, is the closed nature of the network, so interoperability is limited in scope.

Pros:
- Scale and reach
- Security and maintenance from federated model

Cons:
- Closed network/directory model limits interoperability

Sources: https://www.swish.nu/; https://fasterpaymentscouncil.org/blog/6028/Prime-Time-for-Real-Time-2021; https://www.nsbanking.com/analysis/swish-payments-sweden

Faster Payments Council:
Directory Models Work Group

Unified Payments Interface (UPI)

UPI

Summary of the System Profile

Instant adoption as of 2022

Very High

Main use cases supported by RTP

P2P	C2B e-commerce	C2B POS	B2B	B2C Only returns	G2C	G2B
●	●	●	●	●	○	○

Summary

UPI is a mobile-based 24/7/365 system enabling users to send and receive money instantly using a Virtual Proxy Address (VPA). The unique feature of these VPA-based transactions is the secure UPI architecture that makes the need to share bank account details to the remitter redundant. UPI supports P2P and consumer-to-business (C2B) payments and can be used via smart phone (app-based), feature phone (USSD-based) or at the merchant (app-based). UPI facilitates transfers through CTs and DDs, merchant payments, utility bill payments, QR code-based payments (scan and pay), etc. Non-financial transactions such as mobile banking registration, balance enquiry, etc., can also be carried out using UPI. UPI can have multiple funding sources within single applications from participating banks or Third-Party Application Provider (TPAP). Funds can be transferred using VPA or account number with bank code (IFSC).

UPI is an overlay layer that uses the IMPS rails for clearing and settlement, whereas NPCI is the system owner. Banks access UPI as PSPs, issuers and beneficiaries; apart from TPAPs such as Google Pay, Truecaller, WhatsApp, etc. Non-bank Prepaid Payment Instrument (PPI) issuers have also been allowed to provide this facility in an interoperable manner to wallet holders. Transactions are carried out through mobile devices with two factor authentication using device binding and a UPI PIN as security. The UPI PIN is encrypted using Public Key Infrastructure (PKI) technology while the transaction data is stored in encrypted format in the app provider's system. There are many innovations extending UPI to desktops, feature phones, offline payments as well as recurring payments.

Key Facts & Figures

Population (in billions, 2021)	1.39
Markets where service is active	India, Nepal, Bhutan, Malaysia, UAE
Currency	INR
Year service went live	2016
Number of users	200m
Number of members	316
Transaction values	INR 200,000 in 24 hours
Payment rails enabled	Real-time A2A

Sources: Lipis Advisors database, NPCI, RBI https://www.npci.org.in/statistics ; https://www.npci.org.in/what-we-do/upi/product-overview ; https://www.npci.org.in/what-we-do/upi/live-members ; https://www.npci.org.in/what-we-do/upi/3rd-party-apps ; https://www.npci.org.in/what-we-do/upi/roles-responsibilities ; https://www.npci.org.in/what-we-do/upi/dispute-redressal-mechanism ; https://www.npci.org.in/what-we-do/upi/steering-committee ; https://www.npci.org.in/what-we-do/upi/product-statistics ; https://www.npci.org.in/what-we-do/upi/upi-ecosystem-statistics ; https://www.npci.org.in/what-we-do/upi/faqs ; https://www.npci.org.in/what-we-do/upi/circular ; https://www.rbi.org.in/commonman/English/scripts/upi.aspx ; https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/PSSBOOKLET93D3AEFDEAF14044BC1BB36662C41A8C.PDF ; Interview with Dilip Asbe, MD and CEO of NPCI; https://www.npci.org.in/statistics/monthly-matrix

Connecting to UPI: FIs & End-Users

TPAP connect via sponsor banks; using rails of IMPS

How sending/receiving institutions connect to the directory

Mobile banking apps, bank UPI apps and third-party payment service provider apps (TPAP) can provide access to the UPI layer. While banks settle directly, the settlement for TPAPs is done through their respective sponsor banks. TPAP apps need to be certified, which is taken care of by NPCI.

How end users register to the directory

Consumers

- Install any UPI app/PSP available in the play store or app store.
- Open app and enter the phone number that is linked to the bank account
- The app will now ask for the necessary permissions, allow them
- Wait for the OTP and tap on the Next button
- Set the UPI pin
- Click on 'Add Bank Account' and then select bank from the list
- Enter UPI pin to get a UPI ID/VPA
- Enter the UPI ID/VPA whenever they want to make/receive a payment

Merchants and NGOs

Merchants and NGOs can connect to UPI in a very similar to process to how they apply to accept other payments through their banks or PSPs or payment gateways. QR codes are used as a popular VPA choice by merchants of all sizes due to ease of display and use.

Sources: Lipis Advisors database, NPCI, RBI https://www.npci.org.in/statistics ; https://www.npci.org.in/what-we-do/upi/product-overview ; https://www.npci.org.in/what-we-do/upi/live-members ; https://www.npci.org.in/what-we-do/upi/3rd-party-apps ; https://www.npci.org.in/what-we-do/upi/roles-responsibilities ; https://www.npci.org.in/what-we-do/upi/dispute-redressal-mechanism ; https://www.npci.org.in/what-we-do/upi/steering-committee ; https://www.npci.org.in/what-we-do/upi/product-statistics ; https://www.npci.org.in/what-we-do/upi/upi-ecosystem-statistics ; https://www.npci.org.in/what-we-do/upi/faqs ; https://www.npci.org.in/what-we-do/upi/circular ; https://www.rbi.org.in/commonman/English/scripts/upi.aspx ; https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/PSSBOOKLET93D3AEFDEAF14044BC1BB36662C41A8C.PDF ; Interview with Dilip Asbe, MD and CEO of NPCI; https://www.npci.org.in/statistics/monthly-matrix

Directory Set-Up, Maintenance, & Security

UPI holds no account data; PSP responsible for securing data

Types of aliases supported by the directory

- Aadhaar number (essentially the Indian version of an SSN)
- Virtual address
- Mobile number
- Mobile money identifier (MMID)

Securing the directory

The UPI is a two-step directory. When a customer registers with UPI, the UPI directory links the customer's phone number to their financial institution; no account data is held by UPI. Each bank has an internal directory that connects to the UPI directory and this directory links the customer's phone number to the account information. The PSP encrypted database contains the information such as name of customer on PSP app and account no., account & IFSC mapped to the address, device ID. This means that the UPI directory does not store any valuable customer information; banks are required to store and secure customer information.

Ensuring the information in the directory is current

End users are required to ensure that their alias (phone number) is linked to their bank accounts. If a user changes their phone number, they will need to register this number with their bank and change it within UPI.

Is the directory open or closed?

The directory is closed; only customers of participating banks can access the directory and UPI cannot send payments to non-IMPS-affiliated services.

The directory is not searchable. Users input a phone number, which then routes the payment message to a connected bank account. No account data is exposed to end users, i.e., the sending party cannot see the receiving party's bank account using the UPI directory. When a phone number is input to UPI, the directory returns the full first name and the first letter of the last name of the name registered to that phone number. This information can be retrieved by fraudsters by inputting phone numbers, but no account-sensitive information is shared.

Sources: Lipis Advisors database, NPCI, RBI https://www.npci.org.in/statistics; https://www.npci.org.in/what-we-do/upi/product-overview; https://www.npci.org.in/what-we-do/upi/live-members; https://www.npci.org.in/what-we-do/upi/3rd-party-apps; https://www.npci.org.in/what-we-do/upi/roles-responsibilities; https://www.npci.org.in/what-we-do/upi/dispute-redressal-mechanism; https://www.npci.org.in/what-we-do/upi/steering-committee; https://www.npci.org.in/what-we-do/upi/product-statistics; https://www.npci.org.in/what-we-do/upi/upi-ecosystem-statistics; https://www.npci.org.in/what-we-do/upi/faqs; https://www.npci.org.in/what-we-do/upi/circular; https://www.rbi.org.in/commonman/English/scripts/upi.aspx; https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/PSSBOOKLET93D3AEFDEAF14044BC1BB36662C41A8C.PDF; Interview with Dilip Asbe, MD and CEO of NPCI; https://www.npci.org.in/statistics/monthly-matrix

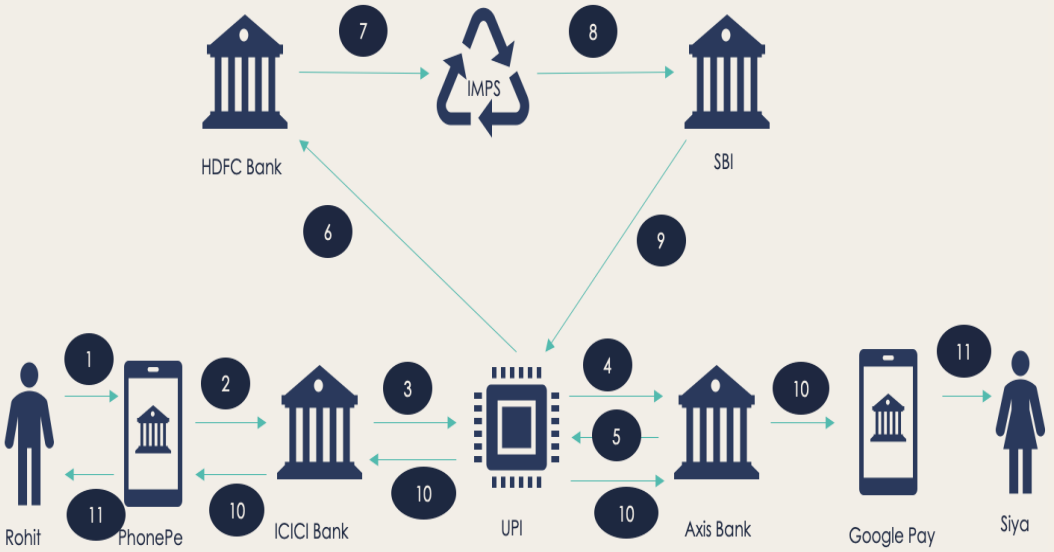
UPI Transaction Flow

P2P push & pull transactions have very similar message flows though UPI

Transaction flow: P2P

Rohit wants to pay Siya back for lunch. Rohit is using PhonePe connected to his HDFC Bank account. He wants to send money to Siya who uses Google Pay linked to her State Bank of India (SBI) account. (1) Rohit opens UPI payment section in PhonePe (PSP) app on his mobile device. Rohit chooses Siya as the recipient from his phone's address book and enters amount details (2)(3) PhonePe uses its sponsor Bank ICICI Bank to send this information to UPI (4) UPI knows that Siya's phone number is linked to Google Pay through its sponsor bank Axis Bank and so sends the request to Axis bank to confirm details(5) Axis bank checks its internal database to confirm that Siya's UPI address exists and is linked to a bank account. It returns the bank account and IFSC to UPI (6) UPI hands over the authorization to HDFC Bank to verify Rohit's PIN and debit his account (7)(8) HDFC Bank sends this information over IMPS to SBI to credit Siya's account (9) SBI credits the account and sends confirmation to UPI (10) UPI notifies both PhonePe (via ICICI Bank) and GooglePay (via Axis Bank) (11) Both apps send out push notifications to notify the Rohit and Siya.

NPCI combines all the transactions that happened during the last period on IMPS and creates a bulk settlement file. It creates settlement reports that are customized to every bank and sends it to every member bank involved. All banks do an internal computation to find how much do they owe someone or how much some other bank owes to them. The final settlement happens at RBI.



Sources: Lipis Advisors database, NPCI, RBI https://www.npci.org.in/statistics; https://www.npci.org.in/what-we-do/upi/product-overview; https://www.npci.org.in/what-we-do/upi/live-members; https://www.npci.org.in/what-we-do/upi/3rd-party-apps; https://www.npci.org.in/what-we-do/upi/roles-responsibilities; https://www.npci.org.in/what-we-do/upi/dispute-redressal-mechanism; https://www.npci.org.in/what-we-do/upi/steering-committee; https://www.npci.org.in/what-we-do/upi/product-statistics; https://www.npci.org.in/what-we-do/upi/upi-ecosystem-statistics; https://www.npci.org.in/what-we-do/upi/faqs; https://www.npci.org.in/what-we-do/upi/circular; https://www.rbi.org.in/commonman/English/scripts/upi.aspx; https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/PSSBOOKLET93D3AEFDEAF14044BC1BB36662C41A8C.PDF; Interview with Dilip Asbe, MD and CEO of NPCI; https://www.npci.org.in/statistics/monthly-matrix

P2P & E-Commerce Have Exploded in India

UPI has zero fees for users; making it cheaper to accept than cards

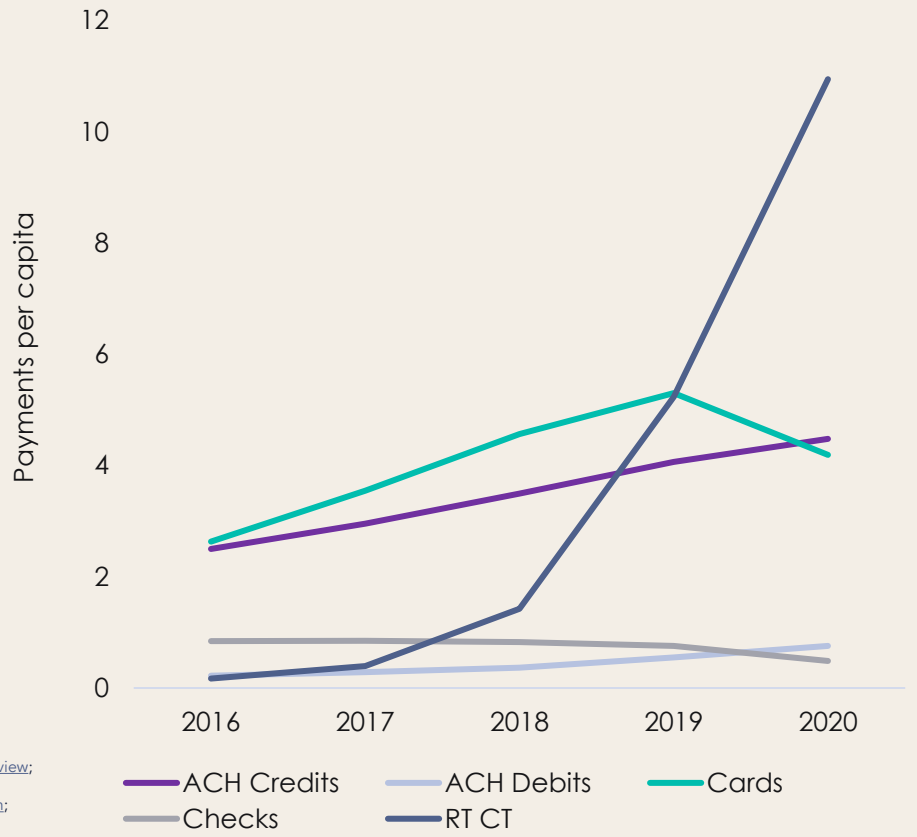
2020 was UPI's breakout year

Launched in 2016, UPI has seen tremendous adoption, further accelerated by the Covid-19 outbreak, surpassing 1 billion transactions for the first time in October 2019. The next 1 billion came in under a year – in October 2020 UPI processed more than 2 billion transactions for the first time. The journey from 2 billion transactions a month to 3 billion was traversed in 10 months, indicating the incredible popularity of UPI as a platform for retail digital payments among consumers. It took only three months for the payment platform to reach 4 billion transactions per month. In March 2022, UPI processed more than 5 billion transactions in a month for the first time.

UPI has a maximum transaction value of INR 200,000 (USD 2,600) per transaction but there might be bank-imposed limits. The cap for retail subscribers to initial public offerings (IPOs) through UPI has been hiked from INR 200,000 to INR 500,000. There are no limits in terms of the amount of money users can receive per day as well as the number of transactions that can be made per month.

In terms of pricing, UPI is free for P2P transactions. UPI falls under the government's zero merchant discount rate (MDR) policy, meaning merchants are not levied any charge for accepting payments under this method.

Interbank non-cash payments per capita, 2016-2020



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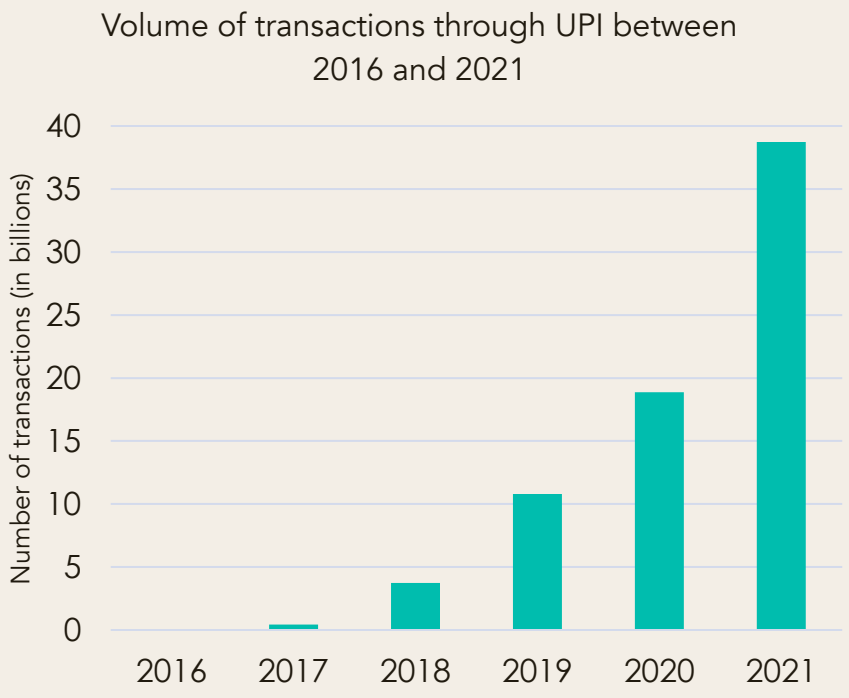
Lessons Learned for the U.S. Context

Non-bank access and regulatory support key to increased adoption



Source: NPCI

Comparing India and the U.S.

India is still a very cash-heavy economy and has similar concentrated banking market to the U.S. (in 2017 India's CR5 was 47.03 compared to 46.2 for the U.S.). UPI was created by NPCI in conjunction with RBI and with general support from India's banking sector and governmental push from day 1. The growth of UPI has been phenomenal, aided by demonetization and accelerated by the pandemic. In 2021 UPI had processed more than 38 billion transactions, amounting to Rs 71.59 trillion. UPI has become the go-to electronic payment mode in India owing to the interoperability. Recently UPI has been made available to users of feature phone, therefore tapping into a sizable population without smartphones.

In contrast to the U.S., the Indian market does not have any major domestic competitors to UPI, partially because of the interoperability provided by UPI and third party; this of course lessons the overall utility of third-party access and API integrations for fintech applying the UPI example to the U.S. market.

Lessons learned for U.S. market

The case of UPI demonstrates the utility of non-bank access for a directory. This provides for development of innovative services in conjunction with the payment offering by fast evolving fintech players and increased adoption by customers and businesses alike. Furthermore, enabling the PSP to be in charge of customer data limits the risk of having a centralized directory from a data protection perspective.

Conclusion

In terms of the core attributes identified by the Working Group (safety, interoperability, and governance), the UPI directory fulfills at a minimum of 2 (safety and interoperability), if not all 3. Going back to the 8 characteristics, it fulfills at least 7 (all but #3, supports multiple routes linked to payment alias).

Sources: Lipis Advisors database, NPCI, RBI https://www.npci.org.in/statistics; https://www.npci.org.in/what-we-do/upi/product-overview; https://www.npci.org.in/what-we-do/upi/live-members; https://www.npci.org.in/what-we-do/upi/3rd-party-apps; https://www.npci.org.in/what-we-do/upi/roles-responsibilities; https://www.npci.org.in/what-we-do/upi/dispute-redressal-mechanism; https://www.npci.org.in/what-we-do/upi/steering-committee; https://www.npci.org.in/what-we-do/upi/product-statistics; https://www.npci.org.in/what-we-do/upi/upi-ecosystem-statistics; https://www.npci.org.in/what-we-do/upi/faqs; https://www.npci.org.in/what-we-do/upi/circular; https://www.rbi.org.in/commonman/English/scripts/upi.aspx; https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/PSSBOOKLET93D3AEFDEAF14044BC1BB36662C41A8C.PDF; Interview with Dilip Asbe, MD and CEO of NPCI; https://www.npci.org.in/statistics/monthly-matrix