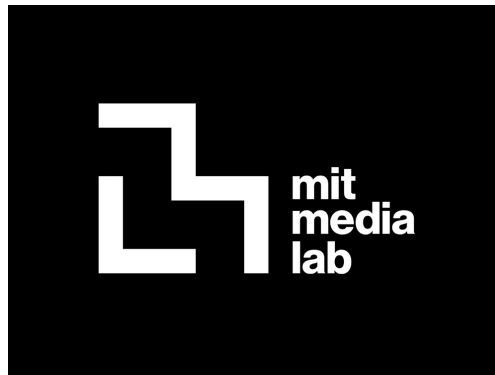


Multi-Jurisdiction Financial Services – A New Global Perspective

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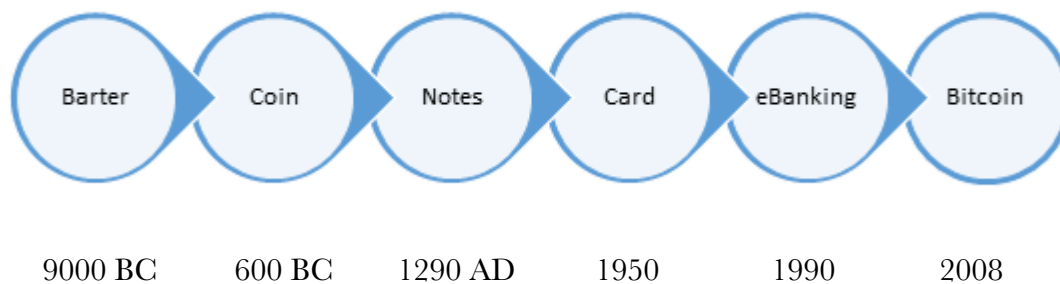
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1. The history of value exchange and the rise of digital payments

Payments or exchange of value in some form or other has been at the heart of all the economic transactions in our human society. Hence, it would not be an exaggeration to call payments a significant social infrastructure. And, as our society has evolved over time, so have payment systems. Payment systems have travelled a long way from barter to cash to card to mobile wallet-based forms of payment. Evolving technologies and innovation have been critical in this journey of payment systems, however there have been some constant drivers such as the need for more convenient and secure method of value exchange.



The digital payments landscape is evolving at a rapid pace, especially with the growth of digital technologies in the financial services sector. The proliferation of smartphones and accessibility to the Internet has led to an exponential growth in digital payments across the globe.

“The normal business model of taking a small percentage of each transaction is prohibitively expensive for high volume low value payments.” – Frontiers of Financial Technology¹. Breaking into this business model, digital payments have shown potential to be more inclusive and help bring the bottom billions of earners in the world’s population into the formal financial services domain. The recent thrust towards digital payment systems can be summed up by some major enabling factors as highlighted in a recent Boston Consulting Group report²:

- Ongoing technological and digital revolution
- Entry of non-traditional players
- Demand side push (Customer expectations)
- Enabling regulations

Payment fintech startups range in a broad landscape including digital wallets, integrated point-of-sale systems, peer-to-peer payments and cross-border transfers.

¹ ‘Frontiers of Financial Technology: Expeditions in future commerce, from blockchain and digital banking to prediction markets and beyond’, Visionary Future publication, David Shrier and Alex Pentland, 2016

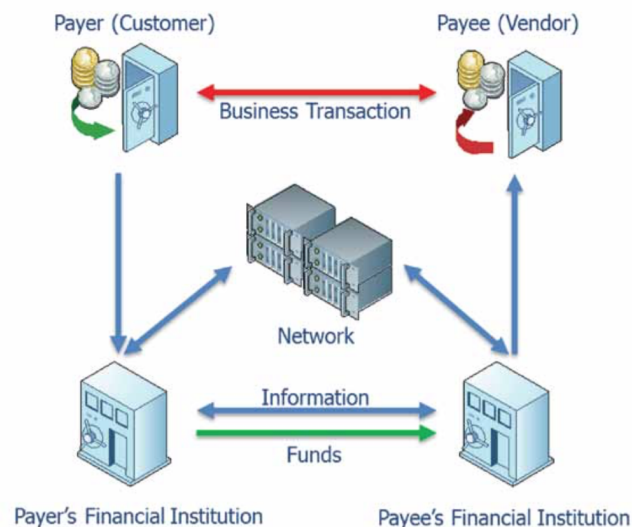
² ‘Digital Payments 2020 – The Making of a \$500 Billion Ecosystem in India’, Boston Consulting Group, 2016

The focus of this innovation roadmap is on multi-jurisdiction digital payments and credit provision through the use of alternative data. Another aspect we focus on in this report is the role and need of a robust digital identity system for widespread use of digital financial services and new avenues in the field of financial technologies.

2. The Evolution of Payment Technology, and its Contribution to Economic Development and Financial Inclusion

2.1 Payment Infrastructure

Payment infrastructure refers to the set of technologies and processes that enable the transfer of monetary value from one person or entity to another³. Payment infrastructure requires coordination between several stakeholders such as the payer, the payee, financial institutions, processors, and settlement institutions.



This infrastructure allows payment routing through four channels; paper-based payments, high-value transfers or wires, batch systems, and card-based payments. Some of these channels are inefficient, costly, time consuming, and cannot be adopted for large scale cross-border payment transactions.

Paper-Based Payment Systems

Although many technological strides have been made with paper-based payment channels such as checks, this channel does not convey payment information quickly enough for many transactions, particularly e-commerce transactions. Paper-based payment channels are also virtually inefficient for cross-border transactions.

High Value Transfers (Wires)

High-value transfers or wires are often used between businesses when there is a need for secure, rapid, and final monetary value transfer. The central bank often acts as a guarantor and

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http://www.treasuryalliance.com/assets/publications/payments/Fundamentals_of_Payment_Systems.pdf

intermediary for these transactions and instructions are routed through proprietary bank systems, involving real time gross settlement using SWIFT (among other systems) which can become quite costly.

Batch Systems

Batch systems handle large volumes of low-value transfers. An originating depository financial institution processes multiple payment instructions per batch and sends to an intermediary. This intermediary then distributes all payments to the receiving financial institutions. Batch systems were traditionally used for domestic transfers but have recently seen an increase in the processing of cross-border transfers. Because payment instructions have to be passed between several entities, batch system payments are often processed over a few days.

Card-Based Payments

These include debit and credit card transactions. Card transaction information is sent to a merchant acquirer – often a bank – for authorization. The merchant acquirer queries the card issuing bank for authorization via a card network and relays the authorization to the merchant. At the end of the day, bulk transactions are settled through a batch payment system. In an effort to ensure secure transactions, new card based payments such as single use cards or virtual cards are being used. These cards, however, use the same clearing channels as debit and credit cards.

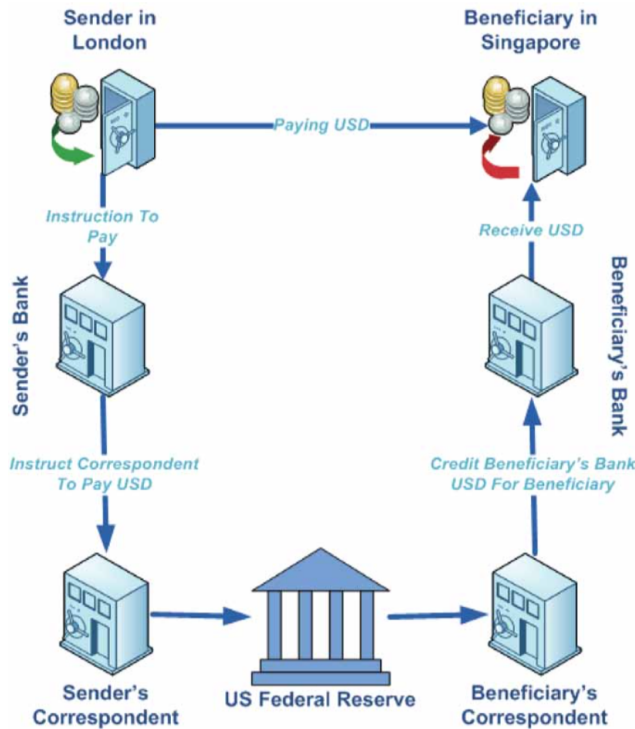
Many of the payment channels discussed above are applicable for domestic payments since payment settlement is often handled between banks, using the central bank as an intermediary. The requirements for cross-border payments are far more complex than traditional infrastructure can handle, however recent technological advancements have allowed consolidation of several components of payment infrastructure, making it possible for cheaper, faster, and more secure cross-border payments.

2.2 Cross-Border Payment Infrastructure

Cross-border payment refers to transactions that involve individuals, corporations, settlement institutions, central banks, governments or a combination thereof, in at least two different countries⁴. Cross-border payment infrastructure refers to the systems and mechanisms established to ensure the clearance and settlement of these monetary and other financial transactions. In the past, cross-border payments have relied on time intensive and expensive infrastructures such as SWIFT and transfers between national reserve accounts. Unlike domestic payments, where the central bank often acts as an intermediary for payment settlements, banks often use depository and reserve accounts to settle cross-border payments.

An example is illustrated overleaf of a transaction between the UK and Singapore in USD.

⁴ <http://www.cemla-remesas.org/medicion/PDF/seminariomx2006/JoseGarcia01.pdf>



With the proliferation of internet and mobile media, more advancements have been made in enabling cross-border payment transactions. The majority of these technologies are focused on improving the ecosystem to support the global flow of money and payments rather than inventing or developing new infrastructure. At the base of these innovations is a quest to eliminate the need for intermediaries, central banks, and the need for federal reserve account transfers from the payment infrastructure ecosystem.

Cryptocurrencies like bitcoin, e-payments including peer-to-peer online transfers like PayPal, and digital wallets like Venmo are among examples of infrastructure that function without an intermediary, a central bank, or a reserve account. These systems allow for real time transfers which in turn significantly reduces overhead costs associated with cross-border payment transfers. Because these transactions are real time, many service providers transfer funds without holding the funds for prolonged amounts of time; thereby, reducing the need for liability coverage similar to FDIC insurance for U.S. bank accounts.

In addition to the cost and time effectiveness of new payment technologies, new payment technologies have increased the risk of fraudulent activities in payment processing⁵. The ease of payment processing has made it easier for payment systems to be hacked but service providers are innovating around this issue with products like RevenueProtect from Adyen. By reducing the number of steps in the payment flow, less data is collected, and the harder it is to identify and stop fraud. RevenueProtect uses data and machine learning technology to identify and quickly stop fraudulent payments.

⁵ <https://www.adyen.com/blog/top-5-payments-trends-for-2017>

2.3 The Role of Cross-Border Payment & Remittance Systems in Trade & Economic Development

Payment Systems

Cross-border payment infrastructures are crucial to trade and economic development, particularly in emerging economies. Beyond promoting trade and economic development, safe and efficient cross-border payment infrastructure supports financial stability by reducing or eliminating the settlement risks related to financial transactions. Cross-border payments have also significantly increased access to the global e-commerce market. While this ability was pioneered by companies such as PayPal and Square, many other companies have emerged with variations in their offerings.

Stripe and Flutterwave have developed infrastructure that covers all aspects of processing payments; from providing the Payments Gateway API to managing payments risks and settlement, thereby, reducing the risk of failed payments and reliance on legacy systems. Furthermore, some companies focused on large ticket cross-border payments. For example, Flywire is a backend technology that has made it increasingly easy for consumers, particularly international students to make cross-border payments to educational and medical institutions.

Parallel to increasing access to the global e-commerce market, new payment technologies have also made it possible for consumers transact globally. For businesses and merchants, customer recognition and data consolidation has become easier and efficient. Tokenization – the process of protecting sensitive data by replacing it with an algorithmically generated number called a token⁶ – has made it possible for merchants to better understand customer behavior and deliver personalized services such as loyalty rewards, customized payment and delivery options, and targeted offers. Tokenization has also enabled one or zero click payments, as well as contributing to fraud detection and control. New payment technologies have made it possible for payment processors and merchants to consolidate payment data into a unified system, across markets and sales channels. Insights from these data allow for further payment processing and customer-centric innovations.

Remittances

Cross-border remittances are international transfers of money between individuals, especially from migrant workers to their families in their country of origin. In 2015, the World Bank estimated that remittances totaled \$583 billion, \$436 billion of which was sent to developing countries⁷. There are estimates suggesting that international remittances make up over 3% of GDP in over 60 developing economies, thus significantly impacting financial and economic development in these countries.

Technological innovations in remittance transfers are similar to those in payment transactions in that new technologies bypass the need for an intermediary, thereby reducing the cost of remittance transfer. Many companies like Sendwave and Thrivesend, among others, have developed business models that generate revenues from foreign exchange spreads, rather than

⁶ <https://squareup.com/townsquare/what-does-tokenization-actually-mean>

⁷ <https://remittanceprices.worldbank.org/en/about-remittance-prices-worldwide>

older business models that charge exchange fees.

The rise of mobile technology has made it possible for remittance platforms to move beyond the traditional cash pickup option for the recipient and enable remittance transfers directly into the recipient's bank account or digital wallet. Similarly, remittance senders are able to move beyond the use of cash and bank accounts for remittance transfers as many companies have developed platforms that allow the use of cryptocurrencies, cellular airtime top-ups, mobile and digital wallets, thus enabling immediate transfers.

One model that is worth mentioning is the TransferWise model; rather than charging a spread on the foreign exchange rate, TransferWise allows customers to deposit funds into any of its accounts worldwide, then releases an equivalent amount of local currency in the recipient's country. For example, say a customer in the U.S. deposits \$100 to the TransferWise U.S. bank account. Within minutes, the equivalent of \$100 U.S. Dollars in Euros will be delivered to a recipient in France.

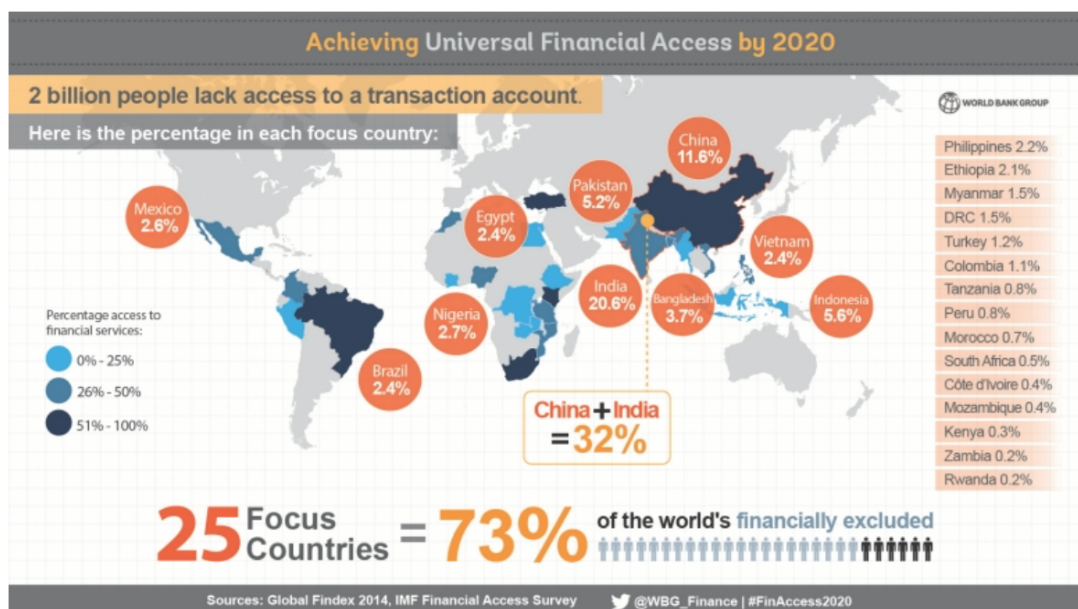
Two things of note with this model: the first is that there isn't actually a cross-border transfer of value; the second is that this model is highly susceptible to influence by the government. Because the TransferWise account will be involved in many local transactions, some governments will be hesitant to allow the existence of such models as it becomes difficult to evaluate the amount and effect of international remittances on the economy. This was the case with the Central Bank of Nigeria and a similar remittance company that was ultimately shut down. The future of remittance transfers is more probable with models that charge a fee or exchange rate spread, rather than one similar to the TransferWise model.

2.4 The Role of Payment Infrastructure & Remittances in Financial Inclusion

In 2014, the World Bank estimated that 2 billion adults lack access to a transaction account and are excluded from the formal financial system globally⁸. In conjunction with public and private sector partners, the World Bank Group set a target to achieve Universal Financial Access (UFA) by 2020. The goal of the UFA is for adults globally to have access to a transaction account or electronic instrument to store money, send, and receive payments by 2020.

The UFA has identified 25 countries, most of which are emerging economies, that make up 73% of the world's unbanked population and devised a plan and strategy to integrate adults in these countries into the global financial market. At the core of this integration strategy is to develop a means to provide access to payment infrastructure, for the purpose of receiving and sending payments. Access to payment infrastructure has been cited and proven to be a leading factor in improving financial inclusion on a global scale.

⁸ <http://www.worldbank.org/en/programs/globalindex>



One example of such infrastructures are the mobile money networks gaining popularity in many emerging economies. The M-Pesa story in Kenya is a great example of a successful deployment of the mobile money infrastructure. In Kenya, the cost of transacting with the financial system was extremely high. It was difficult from a cost and logistics perspective for households to reach a financial institution. For example, 32% of Kenyan households lived over 10km from a bank in the early 2000s. The agent model employed by M-Pesa drastically decreased these costs and made it feasible for many households to interact with the financial system by leveraging a simple technology that was already widely adopted by Kenyans and reducing transaction costs; at full scale, 46% of households lived less than 1km from an M-Pesa agent⁹.

The M-Pesa payment infrastructure story has been repeatedly cited as a success because it increased household savings, increased the use of a bank account, increased consumption and reduced poverty, especially for female-headed households. While network infrastructure such as the mobile money network is critical to storing and moving money – and facilitating the exchange of cash and electronic value – it has failed to unilaterally provide access to financial markets and services on a global scale.

One major critique of the M-Pesa infrastructure is that it hasn't been successfully replicated on a global scale, nor is it a reliable cross-border payment infrastructure. M-Pesa is largely contained within Kenya, and has had minimal success in neighbouring East African countries as well as in the Indian market. Although many mobile money networks have been replicated with slight variations in many emerging nations, the mobile money infrastructure is yet to be proven as an efficient and effective cross-border payment network infrastructure. With international remittances specifically, the mobile money infrastructure powers less than 2% of the global

⁹ <https://www.microlinks.org/sites/microlinks/files/resource/files/The%20Economics%20of%20M-PESA.pdf>

international remittance market¹⁰.

While the mobile money network has yet to prove itself as a contender for cross-border payment transactions, it has significantly contributed to economic and trade development, especially in emerging economies. It has allowed many of the world's unbanked to enter the financial system and has provided access to other products such as savings, loans, and e-commerce opportunities.

2.5 The Future of Payment Technology

Many reports have predicted the future of payment technology to evolve around cryptocurrencies. These predictions are based on the potential of cryptocurrencies to make payment processing more secure, reduce payment processing cost, and bypass central banks and governmental institutions, thereby enabling faster payment transfers. Cryptocurrency technologies are not without disadvantages however. Two of the most commonly cited are the susceptibility to nefarious activities since transactions are anonymous, and the fact that there is no guaranteed immunity against hacking and theft¹¹. Although cryptocurrencies are well poised for innovation in the payment processing space, there certainly is a continued market for payment processing companies using API infrastructure to facilitate payment transfers, either in the form of remittance, online payments, or point of sale transactions.

Additional Resources – Please refer to the Appendix for report and article references, and interview references used in this section.

¹⁰ <http://www.gsma.com/mobilefordevelopment/programme/mobile-money/new-global-mobile-money-dataset-is-a-comprehensive-data-source-for-the-industry>

¹¹ <http://www.investopedia.com/terms/c/cryptocurrency.asp>

3. Rethinking Identity in the Digital Economy of the 21st Century, and the Potential to Change the Way We Deal with Financial Services

3.1 Digital Identity – A critical piece in digital payments and access to digital financial services

As the world is progressing towards a digital economy, the need for a robust, secure and privacy preserving digital identity system cannot be stressed enough. Digital financial services in banking, payments and lending provide a breakthrough in bringing the unserved and underserved population into the financial system. For widespread adoption of digital finance, digital identity management systems are crucial, in order to enable a swift and secure adoption.

3.2 Know Your Customer (KYC) and financial services

The KYC norms are a pain point for the financial institutions which they are mandated to comply with. It is also a pain point for consumers who need to provide various documents like proof of birth, proof of address, and identification documents provided either by government agencies or other recognised entities. KYC is also not a one-time process, but a recurring process requiring information about the customers banks are dealing with to be updated regularly. It is aimed to curb illegal transactions and transfer of value between entities and individuals involved.

In the context of fintech, the KYC norms seems to be an even bigger challenge than for traditional financial institutions which spend a lot of money to comply with these norms. According to a recent report, the on-boarding process can take up to 34 weeks and cost up to \$25,000 per client¹². For fintech companies which serve low value and high volume customers, the traditional methods of KYC verification will make the business unviable and unprofitable. Digital identity can help fintech companies deal with this in a cost-effective manner, and thus provides a great opportunity to innovate in this domain. Traditional financial institutions will also benefit hugely in not just using the digital identity for KYC, but also being poised to provide digital identity services and act as identity providers. A recent World Economic Forum report on digital identity has explored this very particular notion in great detail¹³.

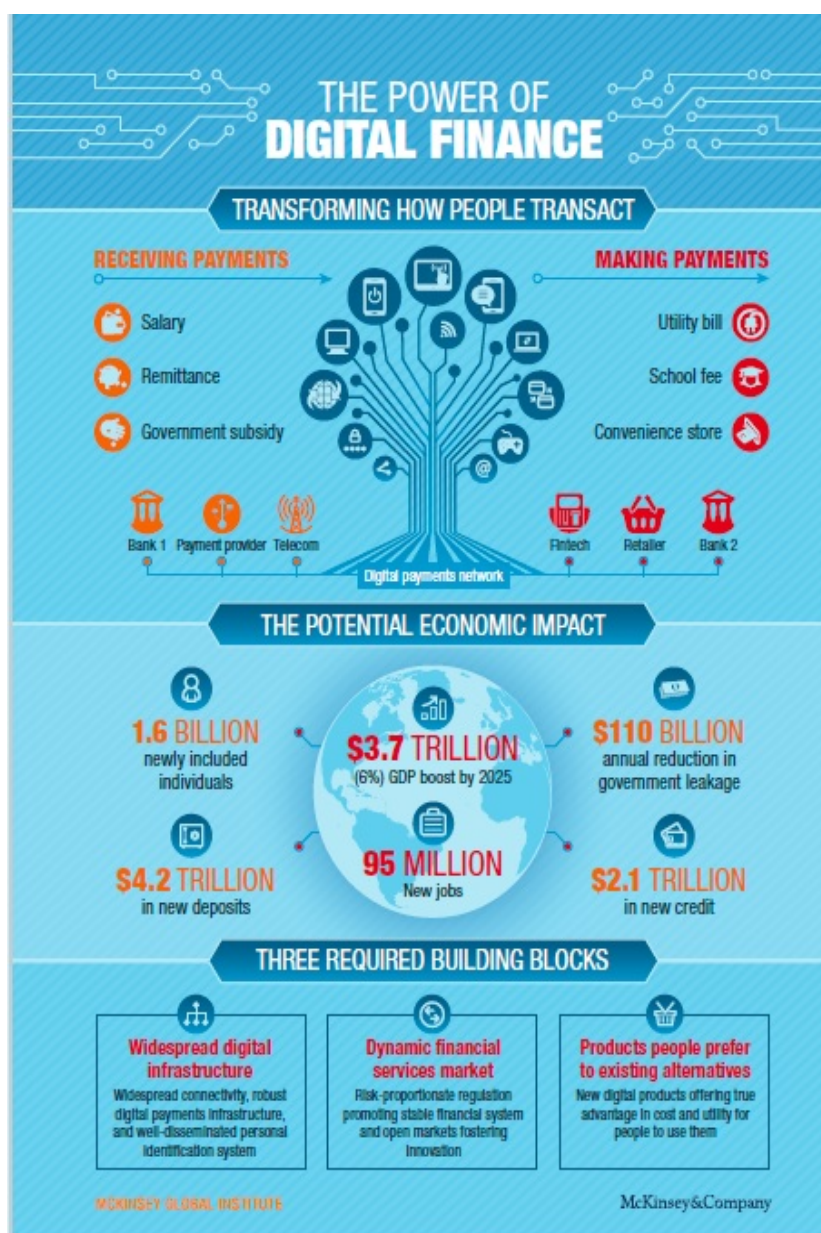
This innovation roadmap of multi-jurisdiction financial services – in digital payments and credit provision – is focused on the huge potential that lies in the emerging markets. A summary of this market potential can be understood from a recent report by McKinsey on ‘Digital Finance for All’. There are 2 billion people in the world without a legal identity, which poses a great challenge for financial inclusion, effectively excluding those people from essential financial services.

This challenge is existing in both developing and developed economies, although the problem is bigger in emerging and underdeveloped economies. More so, whether it be due to the rise of cryptocurrencies and technological innovations in digital payments – or the use of alternative data for assessing creditworthiness – the global financial services ecosystem is heading towards more robust KYC norms, anti-money laundering regulations, privacy and security issues, and

¹² <https://regtechfs.com/digital-identity-kyc-for-the-digital-age/>

¹³ http://www3.weforum.org/docs/WEF_A_Blueprint_for_Digital_Identity.pdf

richer personal data stores, all of which rely on an underlying layer of trust and digital identity.



3.3 Cash-in and cash-out (CICO) transactions

One of the building blocks of a robust infrastructure for digital finance is to have an extensive network of CICO points. Through the networks of agents and point-of-sale (PoS) networks, users can take cash out and put cash into their digital wallets. This is essential to create a seamless digital transaction experience. For these transactions – and especially the cash out transactions – existence of a robust digital identity system is essential to curb thefts and ensure that it is not being used for money laundering purposes.

In an interview with Amir Hasson from Oxigen USA – whose Indian arm is the second

biggest mobile wallet company in India – it was stated that enabling cash out provides the biggest potential of the digital payments market which every current player is waiting to reap. In India, the central bank is doing a pilot¹⁴ with Oxigen to test the cash out from digital wallets using the unique digital identity system of India, AADHAR, provided by the Indian government.

3.4 Credit provision and data rich identity

The world is aggressively moving towards a digital age with people conducting transactions and interacting amongst themselves, and other entities, digitally. This leads to an explosion of big data and the digital trails that we leave behind increasing. A holistic digital identity would comprise of an individual's or an entity's various personas that it has in the digital or virtual world, whereby the personal data that is being generated today is immense. A richer digital identity deriving from privacy preserving data sharing – i.e. creating a personal data store – can potentially provide a solution to digital identity woes and create business value propositions, including the provision of credit. A recent white paper on such a holistic digital identity management system has been explored by MIT's Connection Science initiative.

Such a system providing holistic digital identities would aggregate the user data across various domains and also give the control to the user over its digital identity. This form of digital identity goes beyond the use cases of identification, authentication and verification. Many value propositions can emerge from the rich data attributes. For example, with an increase in the take up of digital payments by the low- to middle-income individuals and SMEs, there will be an extensive trail of digital transactions which can be used for credit analytics and help in the real-time disbursement of loans.

Credit analysis for small ticket loans is currently very expensive for banks and financial institutions, and hence the rate of interest or the cost of capital is very high even if it is ultimately perceived as less risky than loan disbursements to companies and individuals with high creditworthiness as established by traditional credit models. This excludes a large section of the market from credit access through formal financial systems.

Capital Float is an India-based startup that uses financial transaction data to disburse loans in the range of \$1,500 to \$150,000 to SMEs. The prototype test claims that the loans are disbursed within two minutes through mobile phones and the requested amount is transferred to the account directly. This entails a partnership with a big bank in India and other partners which provide the financial transaction data. The financial transaction data trails of merchants with their suppliers or from their customers represents a potentially rich source of data that can be used for credit access.

3.5 Challenges faced in existing Digital Identity systems:

Maintaining Simplicity – With digital payments and other digital financial services, the key is to make the entire process simple, whether from a cash based system or from traditional banking. However, with complex KYC norms, fintech companies and digital finance solution providers are facing a big challenge. On one hand, they have to comply with the stringent norms which require

¹⁴ <http://www.businesstoday.in/moneytoday/perspective/withdrawing-cash-from-mobile-wallet-prepaid-cash-card/story/200921.html>

some sort of physical identity and verification, while on the other they need to keep it simple, digital and mobile first, for retaining and acquiring consumers.

Security – A big challenge being faced is the security and privacy of users. Due to lack of a robust digital identity system there is a huge concern about fraudulent transactions due to a privacy breach of identity attributes, which affects consumer confidence as well as potentially incurring heavy monetary losses. In fact, the traditional banking system is facing this challenge as well. In 2014, around 15.4 million consumers in the U.S. banking market were victims of identity theft or fraud resulting in a loss of \$16 billion¹⁵.

Scalability – The other big issue is achieving a scalable solution to digital identity management. The existing systems are largely fragmented leading to a single siloed system. As a result, the entire authentication and verification system is rendered inefficient, hence there's a strong need of a digital identity system that cuts across markets and identity service providers. Since the digital identity challenges have caught the attention of many market participants, various efforts are being done at proprietary, industry and policy levels, leading to confusion.

Example 1. AADHAR – Digital Identity Scheme in India

Aadhar is a unique digital identity system in India, governed by the Indian Government and has covered more than 1 billion people to date. This is being considered as a leapfrog by India advancing ahead of many western countries like the U.S.

Aadhar, a biometric linked ID, has provided an identity layer to conduct transactions and various other services digitally, cutting across markets. India recently launched an Aadhar-based payment mobile application called 'BHIM'¹⁶. This is primarily a merchant application and, since it can be linked to biometric authentication, the consumer only needs to provide a thumbprint to conduct transactions, and a bank account linked to the Aadhar card.

This is a pathbreaking technology feature enabling digital payments in India. Various digital payment companies are using this interface to capitalize on this feature and minimizing even the role of plastic cards and point-of-sale machines. However, there have been serious concerns with this type of system.

This system takes very sensitive data like biometrics and the entire data is kept in a centralised ID management system, with a single point of failure acting as a 'honeypot' for hackers and fraudsters. In addition to this, the sensitive personally identifiable information (PII) and the other Aadhar card details are susceptible to exposure and privacy breach raising serious concerns.

¹⁵ <http://www.washingtontimes.com/news/2015/sep/28/identity-theft-affected-176-million-cost-154-billi/>

¹⁶ http://www.business-standard.com/article/economy-policy/bhim-aadhaar-based-app-launched-to-simplify-digital-payments-116123000997_1.html

Example 2. Estonia - leading the way in digital identity

Estonia and other Nordic countries like Norway, Finland, Sweden have been leading the world with their push towards a digital economy and e-governance. Around 98% of banking transactions in Estonia take place on the Internet, hence the country is much less dependent on cash.

Startups like GuardTime¹⁷ and Bitnation have been developing blockchain based solutions for secure storage digital identity attributes data and creating digital identity for not just Estonian citizens, but also a borderless digital identity recognized by the Estonian government. Nonetheless, a complete and holistic digital identity management system is yet to be rolled out on a large scale, however the initiatives have so far been promising.

3.6 Blockchain technology for Digital Identity systems

Various financial institutions and fintech companies are looking at blockchain technology to solve the problem of digital identity:

<i>Entity</i>	Object, Device, Transaction, Or Document	Individual: <i>Citizen, resident, user, etc.</i>	Private Sector: <i>e.g., employer, bank, insurance</i>
<i>Illustrative Identity Attributes/ Documents</i>	<ul style="list-style-type: none"> • IP Address • Serial Number • Transaction ID • Object Provenance 	<ul style="list-style-type: none"> • Names (legal, username) • Gender, Nationality, Ethnicity • Contact information (address, email, phone number) • Biometrics (fingerprint, iris, face) • Digital Financial transaction history • Social media data, mobile network data 	“Individual” identity attributes, plus: <ul style="list-style-type: none"> • Employer ID • Healthcare ID • Account Numbers • Proof of Professional certification
<i>Illustrative Pain Points</i>	<ul style="list-style-type: none"> • Counterfeiting and piracy are on the rise, projected to reach \$2.3T globally by 2022 • IoT devices increase security vulnerabilities. By 2018, 2/3 of enterprises globally will experience IoT security breaches • Card-Not-Present transaction fraud is increasing and is projected to grow from \$2.8B in 2014 to \$7.2B in 2020 in the U.S. 	<ul style="list-style-type: none"> • 1.5B people globally lack identification, representing 1/5 of the world’s population. This results in marginalization and service exclusion • ID theft is on the rise. 15.4 million U.S. consumers were victims of ID theft in 2016 • Hackers have exposed the personal information of 110 million Americans – roughly half of the nation's adults – in 2014 alone • According to Apple, 89% of their average iPhone users with a Touch ID-capable device have set it up and use it to unlock their phones an average of 80 times a day 	<ul style="list-style-type: none"> • U.S. Companies and government agencies suffered 1,093 data breaches in 2016, a 40% increase from 2015 • The costs of compliance with Anti-Money Laundering (AML) and Know-Your-Customer (KYC) regulations are increasing. AML compliance costs rose by an estimated 50% between 2012 and 2015

¹⁷ <https://e-estonia.com/component/keyless-signature-infrastructure/>

<i>Select Blockchain Value Drivers</i>	<ul style="list-style-type: none"> • Enhanced traceability via blockchain's secure, immutable ledger can validate object provenance, provide a history of transactions, and a history of device connections to a network • Smart Contracts can validate transactions using pre-defined, coded rules to increase security 	<ul style="list-style-type: none"> • Increased privacy and protection against theft of identity attributes using blockchain's cryptography and access provisioning • Convenience of alternative IDs, verified on the blockchain, to manage reputations and establish trust for online transactions 	<ul style="list-style-type: none"> • Enhanced portability of digital identity between businesses for faster enrollment and synchronized updates • Privacy, enhanced security and increased control over identity attributes through consent-based sharing • Reduced cost of compliance
<i>Select Blockchain Organizations/ Startups</i>	<ul style="list-style-type: none"> • Microsoft + Tierion • Blockstack Labs • BlockVerify • GuardTime • Case 	<ul style="list-style-type: none"> • Microsoft + OneName/BlockStack Labs + ConsenSys • Deloitte Smart ID (UK) • ShoCard • BlockAuth • Uport • 2WayIo 	<ul style="list-style-type: none"> • SecureKey / Concierge (Canada) • ShoCard • EY (Australia)

3.7 The future: Blockchain enabled Digital Identities?

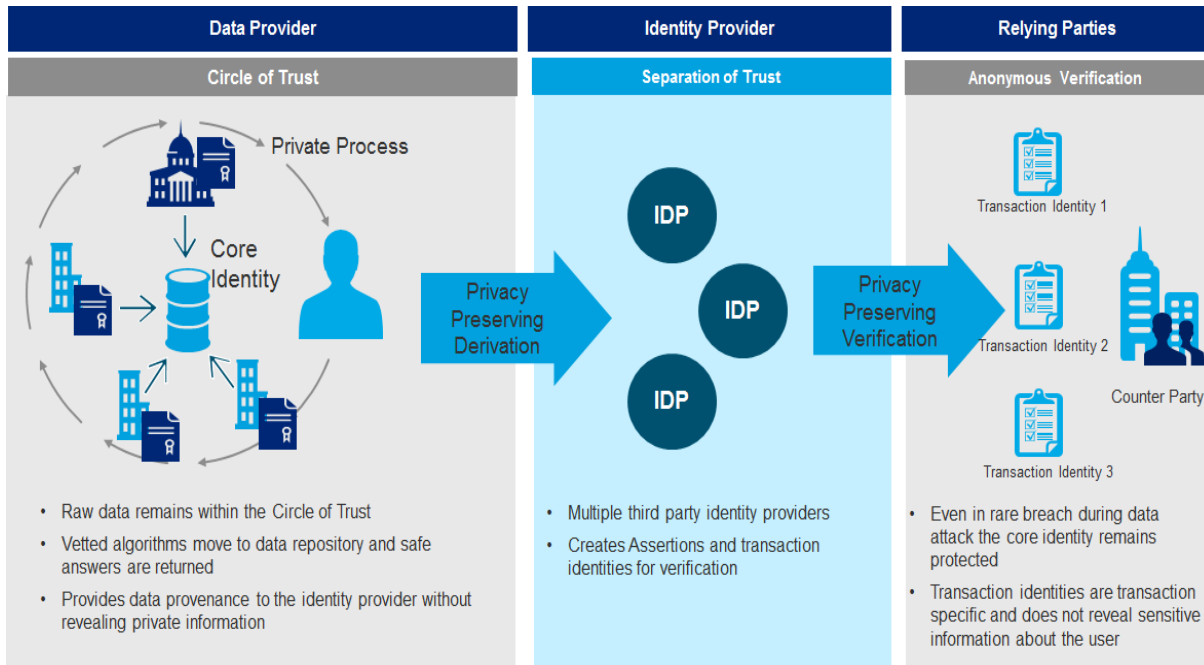
It is critical to first imagine and define the new digital identity systems and architecture which could solve the problems with existing systems, and then how blockchain technology could act as an enabler to make it a reality. The problem that the industry faces due to the hype of blockchain technology is that the identity systems are being approached with the blockchain technology at its core. Thomas Hardjono of MIT's Consortium of Internet Trust asserts that it's still very early days for blockchain technology. Moreover, it is not the technology which is a bigger challenge but the standardization of the technology, necessary legal frameworks to support the envisioned systems and managing the resistance of the incumbent industry players and norms.

The architectures discussed in the MIT Connection Science white paper on Digital Identity foresee that digital identity systems provide control to users over their data and identity attributes. The user can decide what to share and with whom for different use cases. In this scenario, there will be different business cases that will need to be looked into by the identity providers, who may not be the same as government agencies or other technology giants which currently control our data. Such self-sovereign identity management systems with a decentralised system would reap the benefits of blockchain technology to the maximum. The other two identity management systems, namely centralised and federated, do not offer full control to users, and still don't solve the challenges pertaining to a single point of failure which is the case in centralised digital identity systems like the AADHAR system in India.

Deriving from the identity management architecture as approached in the paper by MIT Connection Science, we can understand the system as displayed in the following graphic. The role of different stakeholders in a digital identity management system, namely: the user; identity provider; and relying parties have been potentially identified, as well as how the collaboration of government agencies, industry players and identity providers (creating a new opportunity for

startups), can help foster such a digital identity management system. Partnership from industry players like financial institutions, healthcare providers and e-commerce giants would enable privacy preserving data sharing to take place and create a robust and holistic digital identity system.

Privacy-preserving data sharing ensures robust and secure Digital Identity Systems:



One important thing to keep in mind while envisioning a blockchain enabled system is what should be kept on the blockchain and what should be kept off the blockchain. Even though blockchain technology provides an added level of security due to its immutable nature, the sensitive digital identity attributes or personally identified data including biometrics should not be kept on the blockchain, with only hashed attributes being kept that point to the raw data. Since the data sharing takes place privately the raw data is never exposed to hackers and the source of truth can be verified since it is kept on the blockchain and is this immutable.

There are various models and prototypes being piloted by startups in the digital identity space, and there are market signals from governments worldwide and industry players that are beginning to tackle the challenge of digital identity systems. Below we present a snapshot of 10 startups which are the most active in enabling blockchain digital identity use cases:

Startup	Summary	Partners	Blockchain Type
2WAY.IO	WAY.IO effectively transforms public nodes into private nodes by adding a permissions layer. Private nodes can connect information silos & secure communication channels.		Blockchain Agnostic

Authenteq	Authenteq is an automatic identity verification platform that uses a facial recognition algorithm to create a digital identity on a blockchain.		Unknown
BitNation	Bitnation is a governance 2.0 platform that is powered by blockchain technology. Its goal is to provide the same services that governments provide, but in a decentralized and voluntary manner, unbound by geography. Bitnation has worked out an identification solution such as blockchain passport and a marriage certificate.	Estonian government to offer notary services to Estonia e-residents	Blockchain Agnostic
BlockAuth	BlockAuth enables you to own and operate your own identity registrar that allows users to submit their information for verification.		Unknown
BlockVerify	Provides blockchain-based anti-counterfeit solutions. It uses blockchain technology to improve anti-counterfeit measures in different industries such as pharmaceuticals, luxury items, diamonds and electronics.		Other/ Private
Case	Provides biometrically secured multisignature bitcoin transactions. Case is a multisignature, multifactor wallet that requires two of three keys for a transaction to take place. Each key is generated and stored in a different location and is protected by a different authentication factor so that there's no single point of failure.		Unknown
Civic	While most identity protection services alert their customers based on credit reports fraud long after the identity was compromised, Civic aims to take a proactive role and alert users by push notifications to their smartphone when their SSN is used for a transaction.		Bitcoin
ConsenSys' Uport	uPort is an open source software project to establish a global, unified, sovereign identity system for people, businesses, organizations, devices, and bots.		Ethereum
Evernym	Evernym is developing the first "self-sovereign identity platform" on a permissioned distributed ledger called Sovrin, which is dedicated solely to identity, and it is fully open source (FOSS).		Other/ Private
Guardtime	Guardtime KSI Cybersecurity Platform enables organizations to assure the integrity of their networks, prevent data loss of critical digital assets and to verify enterprise behaviors. The platform records the state of all KSI-instrumented digital assets by registering them in a global KSI blockchain, generating a mathematically verifiable baseline image of the network.	Government of Estonia	Other/ Private

4. What Alternative Methods Can Be Used to Assess Creditworthiness, and What are the Barriers Preventing More Open Access to Credit?

4.1 Introduction

Current credit provision solutions barely scratch the surface when it comes to addressing the needs of low-income and unbanked populations in developed and developing economies. While growth in developing economies has been happening faster than in developed economies, financial services at the individual consumer level are struggling to catch up. Despite the hype surrounding micro-finance in recent years, a large number of low-income communities still have no access to formal sources of credit.

The key barrier to fully opening access to credit to the poor and unbanked is the high customer acquisition cost faced by traditional for-profit lenders. Conducting background checks and adhering to “know your customer” (KYC) standards is labor intensive – due to a lack of customer information for risk assessment – and regulations in many countries require credit providers to undertake detailed customer identity verification even for small transactions¹⁸.

Nonetheless, there exists an enormous potential market if banks and other financial institutions are able to embrace financial inclusion of the poor and underbanked. Despite the significant upfront costs and challenges, we argue that institutions should seek to harness this long-term potential – utilizing advances in technology and government stimuli – to offer not only payment and remittance solutions, but access to a wider range of financial products and services.

In this paper, we look at the current alternative technological methodologies employed by credit providers (lenders) and intelligence providers (analysts), the limitations of their business models and challenges that they face, and then seek to identify potential visions of the future for credit provision to consumers on a global scale.

4.2 Credit Providers

Roughly speaking, existing credit providers can be assessed along two axes: (x) for-profit vs. nonprofit and (y) local vs. multinational. Local for-profit companies operate in one country and have built efficient and (relatively) effective lending products within those markets, utilizing their experience to grow the business. One example, Branch (established in 2015), is based in the USA and Kenya and provides loans to individuals and small business owners based on algorithmic decision-making involving mobile phone data – such as GPS location, call/SMS history and patterns – and battery status. These loans range from \$2.50 to \$500¹⁹ and require a mobile money account to receive funds and make repayments. In common with most credit providers, borrowers can build a credit profile based on their repayment history in order to access lower interest rates and/or larger loan sizes over time.

Branch faces competition from a number of similar companies (M-Shwari, Saida, Tala, to name a few). Tala (formerly InVenture), an example of a multinational for-profit company, offers

¹⁸ World Economic Forum Insight Report, ‘Redefining the Emerging Market Opportunity’, 2012

¹⁹ https://branch.co/how_we_work. Accessed May 15, 2017

credit through its app which claims to utilize over 10,000 data points on each customer's (borrower's) phone²⁰, from financial transactions to daily movements via GPS. Loans range in size from \$10 to \$500, with an average amount of \$50, 11% interest rate and repayment rate of over 90%. To date, ~66% of its 30-day loans have been used for small business purposes²¹. Tala has a presence in the USA and Kenya, and operates throughout East Africa and Southeast Asia, in countries like Tanzania and the Philippines.

Despite the promise of expansion (scaling) across borders, the use of mobile phone data is still somewhat primitive and it remains to be seen if this data alone is a reliable enough indicator of creditworthiness to support a large commercial lending venture. There is also an argument that individuals that have access (i.e. credit means) to regularly use their mobile phones are more likely to favor borrowing from their family and friend network to avoid the high interest rates and strict repayment terms demanded by commercial credit providers.

Figure 1: Example of lending decision process (Source: Branch²²)



Nonprofit and multinational operator Kiva, on the other hand, is active in 83 countries (including the USA) and has provided credit to approximately 2.4M borrowers to date²³. Unlike Branch and Tala – which have funded themselves through a venture capital backed model – Kiva raises its funding via crowdfunding, targeting philanthropists and social change enthusiasts. Kiva pioneered this model in 2005 and has facilitated approximately \$970M of loans to date²⁴. Needless to say, this model is not easily scalable on a commercial basis given the need to provide a competitive return to investors.

U.S.-based LendUp is a for-profit venture targeting Americans in the lowest income bracket. It estimates that over half the U.S. population (more than 150M people) has a FICO score below 680, an arbitrary barrier for credit approval within most banks. LendUp offers short-term

²⁰ <http://tala.co/about/>. Accessed May 15, 2017

²¹ <https://medium.com/tala/the-future-of-finance-starts-with-trust-bfa79f05893a>. Published February 22, 2017

²² https://branch.co/how_we_work. Accessed May 15, 2017

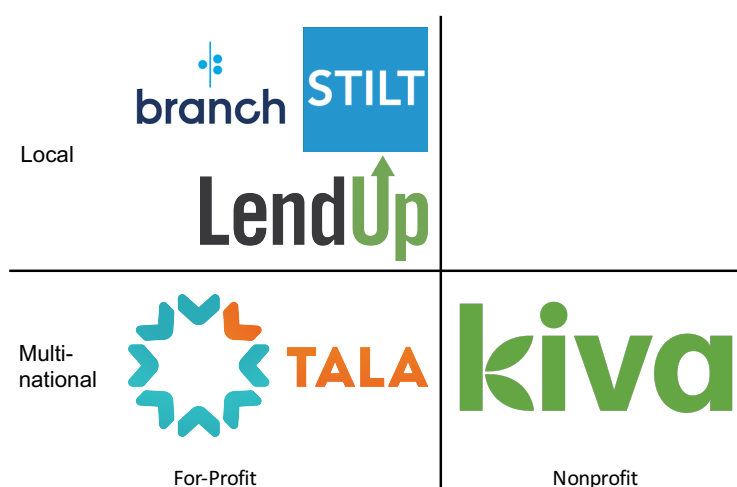
²³ <https://www.kiva.org/about>. Accessed May 15, 2017

²⁴ <https://www.kiva.org/about>. Accessed May 15, 2017

loans (up to \$400 for up to 30 days) at spreads of 15% per month²⁵ across 24 states²⁶, allowing borrowers to build a credit history and hence access lower interest rates. LendUp does not provide much detail about the “most technologically advanced credit platform” that they created, but is not the only machine learning algorithm-based lender active in the U.S. Stilt is a 2016 Y Combinator alumnus that is committed to providing access to credit to immigrants within the U.S., hence broadening access to non-U.S. citizens who are effectively locked out of the local credit market.

Unlike the payments space, which is arguably already highly commoditized and multinational in nature, credit provision is typically built on a local model with deep expertise of the market, hence we witness a significantly higher number of local for-profit players.

Figure 2: Position of credit providers researched during this project



One current project that could provide a positive roadmap for future credit provision in the developing world is a partnership between Branch and Uber in Kenya

Uber has an incentive to facilitate access to credit so that its drivers can borrow towards a car, and in return provides its drivers’ data to Branch to assess creditworthiness²⁷. All a driver needs to do to access a loan (initially KSh 30,000 or ~USD300) is to complete a minimum of 500 trips and have a 4.6* rating on the Uber app. Starter loans are repayable within 6 months at a monthly rate equating to 1.2%. The combination of new data and a (relatively) low interest rate makes this a compelling case study for future collaboration between commercial and financial institutions.

Additional (and reliable) data sources such as Uber driver information represent an exciting development in how future credit scoring might occur. A key requirement for opening access to credit to a more competitive market will be enabling such data to be available to a wider audience,

²⁵ <https://www.lendup.com/rates-and-notice>. Accessed May 15, 2017

²⁶ <https://www.lendup.com/faq>. Accessed May 15, 2017

²⁷ <http://www.techarena.co.ke/2016/11/18/uber-branch-partnership/>

beyond the individual user case for which the dataset was originally created. Richer digital data – via sources such as mobile phone usage – that can be analysed and employed as an informal ‘credit indicator’ can reduce the complexity of creditworthiness assessment and improve banks’ abilities to deliver services to a wider market²⁸.

Research / Interviews Conducted – Credit Providers:

- Branch.co :: <https://branch.co>
- Kiva.org :: <https://www.kiva.org>
- LendUp :: <https://www.lendup.com>
- Stilt.co :: <https://www.stilt.co>
- Tala.co :: <http://tala.co>

4.3 Intelligence Providers

While the availability of funds to lend is obviously a key requirement of an alternative credit provision model, the ability to make informed decisions about credit decisions – and, hence, provide a sustainable business model for commercial lenders – is perhaps the most critical part of the equation. By definition, ‘intelligence providers’ (assuming they are not also lenders) can scale their operations more easily across borders, and most typically work in several geographies, tailoring their product offering according to local requirements.

In this section we examine the current trends between these intelligence providers, broadly along four dimensions:

1. Data sources - where does an intelligence provider find its information?
2. Interface - how does a partner/consumer interact with the service?
3. Partners - who are the end customers?
4. Business model - how do the intelligence provider (and its partners) make money?

Data Sources

Mobile phone data remains a key source of alternative data for intelligence providers, especially in emerging markets. U.S.-based Cignifi provides credit and marketing scores for partners such as Telefonica in order to reach underserved population in developing countries. Additionally, social network data and location (GPS) data are more commonly being utilized. Stanford-spinoff Neener Analytics, for example, uses personality and behavior analysis looking at a consumer’s social media footprint to score financial risk for thin-file, no-file or challenging consumers (estimated to represent 35-40% of U.S. consumers)²⁹.

Harvard spin-off EFL Global started with a straightforward psychometric analysis design, but now includes behavioral gaming in its credit assessment product. Applicants are asked to conduct simulations such as allocating funds to their household budget, which enables EFL to develop deeper insights into financial behavior as well as helping to prevent fraudulent activity on

²⁸ World Economic Forum Insight Report, ‘Redefining the Emerging Market Opportunity’, 2012

²⁹ <http://www.neeneranalytics.com/results.html>. Accessed May 15, 2017

its app.

David Shrier, Managing Director of MIT Connection Science³⁰, believes that psychometrics and social media analytics have so far proven to be an unreliable measure of creditworthiness for existing fintech startups. A CEO of new MIT spin-off, Distilled Analytics, Inc., Shrier is working with predictive models that are 30-50% better at credit analytics than existing bank methods. Borrowing from the findings of Professor Alex Pentland³¹'s studies involving social physics, Distilled Analytics, Inc. is not restricted to analyzing one data source, but is looking to the future and how it can disentangle the many credit indicators which are to be discovered in the masses of data being restored to consumers.

Two recent developments give an insight into the opening up of data ownership and privacy in the U.S. and Europe

In March 2017, the U.S. Senate (subsequently approved by Congress) supported a resolution³² that paves the way for Internet Service Providers (ISPs) to sell consumers' browsing histories to third parties.

Across the Atlantic, from May 1, 2018, subjects of the European Union will benefit from the introduction of the EU General Data Protection Regulation³³ (GDPR) which includes the right for consumers to obtain electronic copies of any data being held about them from all commercial enterprises within the expanded EU territories covered under the Act. This heralds a huge leap forward for Europeans to access and control the data that is available and being seen by third parties in their decision-making, including the assessment of creditworthiness.

Interface

Intelligence providers in general are using cutting edge tech (data analytics, machine learning, etc.) in their products, whereas smartphone proliferation and reliable Internet access are potential barriers for expanding the service in emerging markets. Neener Analytics is a fully web-based B2B (SaaS) offering, whereas EFL Global allows consumers to take the tests in a supervised environment (with local "innovation", in India they have someone with a tablet and a scooter to fulfil this purpose) or online via a web app, for example. New York City-based First Access offers a more customizable credit scoring platform for lending institutions in emerging markets which is accessible through their web interface or API.

In summary, there is no common agreement about the most effective interface between consumers (borrowers) and intelligence providers – the preferred model is likely to be a reflection of the technological maturity of the markets in which borrowers are based.

³⁰ <http://connection.mit.edu/>

³¹ <http://web.media.mit.edu/~sandy/>

³² Senate Joint Resolution 34 (H. Res. 230): <https://www.congress.gov/bill/115th-congress/senate-joint-resolution/34>

³³ http://ec.europa.eu/justice/data-protection/reform/files/regulation_oj_en.pdf

Partners

Financial services companies are, unsurprisingly, the predominant customers of intelligence providers. Traditional banks, credit unions and fintech lenders are all invested in this space, as well as mobile network operators (MNOs), investment companies³⁴, traditional credit agencies such as Equifax³⁵ and retail store chains³⁶ looking to expand their credit offering to desirable applicants. In most cases, intelligence providers provide an additional layer of credit scoring for its clients, which can be customized over time to complement, and potentially replace, a credit provider's existing risk scoring model(s).

Due to the different lending criteria and credit models across financial institutions, intelligence providers typically work with their proprietary model (not trusting any dependent variable data from other sources except for pure financial data) and then expand it to incorporate actual data from the host client. MNOs form an important link in the partnership chain, providing access to mobile phone data which is a key component of many credit intelligence algorithms. Partnerships therefore are truly a two-way street, with data provision and scoring capabilities being the main commodities.

Business Model

There is a definite split in how analytics are being monetized, with traditional access fees (per report request, like traditional credit agencies such as Equifax and Experian) being replaced with specific 'consulting-style' partnerships between an intelligence provider and e.g. a credit institution and MNO. This reflects the high degree of customization which occurs, as well as a desire to ensure close control over consumer data and risk scoring data (which is treated as a competitive advantage of a lending decision-maker).

This raises two key challenges which exist in the intelligence provider ecosystem:

- 1) *How is data ownership and privacy maintained while it is being shared between the various partners?*

First of all, there will continue to be friction and challenges to overcome between the incumbent banks and financial institutions (with their outdated standards and infrastructure for data privacy) and the advanced (cloud based, distributed, etc.) tech world as long as fintech companies attempt to disrupt the marketplace in new and innovative ways. Second, for most intelligence providers that work across different geographies, there will be a lot of variability in the standards they need to satisfy within their customer base.

Typically, an intelligence provider owns the psychometric data that is created via the borrowers' interactions with its platform, and the bank or financial institution owns their own data. The bank will send anonymized records that the intelligence provider matches with a non-PII (personally identifiable information) key that has been created on their side. Such a structure allows intelligence providers to work with banks and financial institutions in jurisdictions with more

³⁴ <https://www.eflglobal.com/wp-content/uploads/2016/05/EFL-CaseStudies-BPL.pdf>

³⁵ <http://cignifi.com/cignifi-and-equifax-partner-to-bring-next-generation-credit-scores-to-unbanked-population-in-latin-america/>

³⁶ <https://www.eflglobal.com/wp-content/uploads/2015/12/EFL-CaseStudies-Edgars-1.pdf>

onerous data privacy laws (e.g. Mexico).

Some intelligence providers have been able to make exceptions for countries with very strict regulations, such as where no data can leave the country (e.g. Indonesia). We are aware of a number of such incidents, during which an intelligence provider will establish a totally separate instance of its technology stack in-country in order to comply with regulations. Needless to say, such a setup is likely to result in higher costs being passed to borrowers but does at least provide a workable solution which can be iterated and improved upon.

2) *How can a consumer's score(s) be transferred across different lenders/credit providers to enable a truly cross-border solution?*

Nova Credit claims its Nova Credit Passport³⁷ – constructed from credit information and credit proxies (such as cell phone billing receipts and records) – is a truly global solution for immigrants to passport their credit scores on all their moves. Partnering with credit unions and fintech lenders in nine countries³⁸ they aim to open up ~\$600B market in new lending opportunities to this highly educated and high-earning customer segment.

EFL Global has a medium-term plan to allow borrowers to take their EFL scores to other institutions (in the same jurisdiction or across borders), however it is complicated as banks have different lending criteria and credit models which are uniquely catered to by EFL's one-to-one consulting services, making a generic product less valuable to individual lenders.

Research / Interviews Conducted – Intelligence Providers

- Cignifi :: <http://cignifi.com>
- Distilled Analytics :: <http://www.distilledanalytics.com>
- EFL Global :: <https://www.eflglobal.com>
- First Access :: <https://www.firstaccessmarket.com>
- Neener Analytics :: <http://www.neeneranalytics.com>
- Nova Credit :: <https://www.neednova.com>

4.4 How Might the Future Look

One intelligence provider we interviewed is already working on chatbot technology to enable an “anthropomorphized credit agent” with better UX (to help build trust and get more accurate answers), dynamic calling (no need to download an app, which is important in many emerging markets with limited data capacity) that can integrate with existing platforms (e.g. via SMS). We also heard consistently that mobile operating networks (MONs) are “sitting on goldmines” given the data they have (calls, top up history, messaging frequency, etc.), hence are likely to become a powerhouse of credit scoring data in the future.

Governmental initiatives like GDPR and the proliferation of IoT devices in the home and wider community will contribute more and more data and place it in the hands of consumers.

³⁷ <https://www.neednova.com/lenders.html>. Accessed May 15, 2017

³⁸ <https://www.neednova.com/about.html>. Accessed May 15, 2017

While the opening up of personal data will introduce profound consequences for how we are perceived in a wide variety of settings – a topic that digital reputation visionary, Michael Fertik, explores exhaustively in his book ‘The Reputation Economy’³⁹ – it also offers a unique ability for the financial services sector to reinvent itself.

New technologies are in the pipeline that promise access to the large numbers of low-income and unbanked global communities in the future digital financial services marketplace.

Future banks and financial institutions (or however else they may be named) will eschew a central bank data repository, easily compromised, in favor of a secure, encrypted distributed data system. Personal data stores not only permit better digital walleting, but also greater security around personal biometric data which is integral to a future bank’s security protocols⁴⁰.

The adoption of digital currencies and distributed ledger techniques serves to drive down the ingrained financial transaction costs inherent in the current banking system whilst mitigating operational risks, which will offer financial incentives to future lenders to include low-income and unbanked populations, thus promoting financial inclusion on a global scale.

We expect AI to play a central role in the mission to disentangle indicators of intent from the masses of data being restored to consumers. Shrier, again, believes AI will enable ‘data monetization agents’ that can analyze individual consumer data in real-time and sell insights to the highest bidder(s) – think about breaking a shoelace as you go for a jog and being shown four advertisements for replacements when you look at your communication device – in order to provide a customized and beneficial service to individual consumers.

Such developments could easily serve to widen the financial inclusion gap between developed and developing economies as long as returns for commercial lending ventures are higher in regions where access to credit is already abundant. This raises the question of where there is a stronger appetite to adopt revolutionary technologies like digital currencies and share personal data to a wider audience – arguably this is higher in markets where there is no workable alternative in place today.

In any case, formal governance mechanisms will become increasingly important in order to overcome trust issues and promote the adoption of emerging technology. Governments and regulators should also work to ensure that consumer financial services are growing in developing economies, such that financial institutions of the future can eradicate poverty and harness the long-term benefits of this enormous potential client market.

³⁹ ‘The Reputation Economy: How to Optimize Your Digital Footprint in a World Where Your Reputation Is Your Most Valuable Asset’, Michael Fertik and David Thompson

⁴⁰ ‘Frontiers of Financial Technology: Expeditions in future commerce, from blockchain and digital banking to prediction markets and beyond’, Visionary Future publication, David Shrier and Alex Pentland, 2016

Appendix

Section 2 – Report & Article References

‘McKinsey & Company – Global Payments 2015: A Healthy Industry Confronts Disruption’
<http://www.mckinsey.com/industries/financial-services/our-insights/global-payments-2015-a-healthy-industry-confronts-disruption>. Accessed May 10, 2017

‘Treasury Alliance Group – Fundamentals of Payment Systems’

http://www.treasuryalliance.com/assets/publications/payments/Fundamentals_of_Payment_Systems.pdf. Accessed April 15, 2017

‘GSMA - Global Mobile Money Dataset’

<http://www.gsma.com/mobilefordevelopment/programme/mobile-money/new-global-mobile-money-dataset-is-a-comprehensive-data-source-for-the-industry>. Accessed April 16, 2017

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Section 2 – Interview References

- Julius Akinyemi | Media Lab Entrepreneur-in-Residence & Director, Unleashing the Wealth of Nations (UWIN)
- Rebekah Scudder | Strategy & Operations, Stripe
- Anonymous Entrepreneur-in-Residence | CTO, Flutterwave Inc.
- Jian Kang | PayPal Product Manager
- Emma Kelsey | Associate, LendUp
- Andries Vaisman | Account Manager, Adyen
- Andrew Berger | Business Development Lead, Square

Section 4 – Google Drive data dump

<https://drive.google.com/drive/folders/0B0V9f4mXGy81Q3ViTjRPZW4tSzQ?usp=sharing>