

AI, Blockchain and Cryptocurrency (ABC) in Financial Inclusion

Credits

Analysts

Ms Soh Rui Min, Spring Analyst

Research

Mr James Tan

Contents

Foreword

3

Defining Financial Inclusion

4

Business Case for

Financial Inclusion

9

Governance Case for

Financial Inclusion

12

AI

16

Blockchain

19

Overview

As of the latest Global Findex Database report published by the World Bank in 2017, a substantial one fourth of the global population remained unbanked amid the advancements in digital financial services¹. At the same time, nearly 60% of the world's population enjoy internet access²; with 91% of the former utilising their mobile devices to go online³.

The emergence of mobile technology and its penetration into developing economies provide an interesting proposition – financial inclusion. The true cost of financial exclusion goes beyond the inability to finance short term consumption. Oftentimes, the lack of access to financial services impedes an individual's ability to substantially accumulate long-term savings, entrapping them further into the web of poverty. By banking the underbanked; and serving the underserved, technological innovations have the potential to increase the accessibility of those currently financially excluded towards financial services. In turn, greater financial inclusion generates sizable socioeconomic benefits, presenting significant growth opportunities to governments, investors, and businesses alike.

Undoubtedly, financial inclusion is a major step towards promoting inclusive economic growth. With the global fintech market poised to grow at a CAGR of around 20% in the next ten years⁴, fintech solutions have the potential to leverage the increasing rates of

¹ Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2018). Measuring Financial Inclusion and the Fintech Revolution (p. 35). World Bank Group. Retrieved from https://globalfindex.worldbank.org/sites/globalfindex/files/2018-04/2017%20Findex%20full%20report_0.pdf

² Kemp, S. (2021). 60% of the World's Population Is Now Online. Retrieved 6 April 2022, from <https://datareportal.com/reports/6-in-10-people-around-the-world-now-use-the-internet>

³ Johnson, J. (2021). Internet users in the world 2021. Retrieved 6 April 2022, from <https://www.statista.com/statistics/617136/digital-population-worldwide/#statisticContainer>

⁴ Goswami, A., Borasi, P., & Kumar, V. (2021). Fintech Technologies Market. Retrieved from <https://www.alliedmarketresearch.com/fintech-technologies-market>

Cryptocurrency	25	
Conclusion	29	mobile usage and internet penetration to develop inclusive solutions for sustainable growth. This report aims to provide an overview of how AI, Blockchain and Cryptocurrency can reimagine the state of financial services by spearheading financially inclusive solutions.

Foreword



When traditional banking systems hold back the human capital development of a quarter of the world's population, a new way of thinking is required.

Financial inclusion, enabled by income, credit history, documentation, and infrastructure, opens opportunities to useful and affordable financial products and services. Financial inclusion has a strong business and governance case.

We envision this inclusion can take place with thoughtful use of artificial intelligence, blockchain and cryptocurrencies.

We further believe its successful implementation will uplift populations and transform economies.

James Tan
Managing Partner
Quest Ventures

Defining Financial Inclusion

The World Bank defines financial inclusion as having access to useful and affordable financial products and services that meet the needs of individuals and businesses. These financial services range from banking, credit, equity to loan products. Over the last decade, with the help of mobile money accounts, the global unbanked population fell by 35%⁵. To put things into perspective, this statistic denotes that 1.2 billion formerly unbanked individuals have now gained access to financial services⁶.

Lack of income and poor credit history

Where the 2017 Global Findex Database report approximates that 30% of adults globally do not hold a basic transaction account, a lack of income has been cited as a main roadblock. Unable to meet the requirements of the traditional banking institution, these groups are excluded from the financial sector; preventing them from accessing resources to establish a business, fund their education and improve their quality of life.

The traditional banking system is not always designed in the interests of low income households. To make up for the lack of profitability in checking accounts, major financial institutions such as Wells Fargo and Bank of America impose overdraft fees, debit card swipe fees, ATM withdrawal fees, wire transfer charges on 25% to 40% of their accounts⁷. While the fees may seem insignificant to the average individual, when amassed, they create an insurmountable burden to lower-income workers living from paycheck to paycheck. With such barriers to access traditional financial services, many low income households in America are left with no choice but to turn to alternative financial services providers, comprising check-cashing outlets, payday lenders, pawnshops, rent-to-own stores, and auto title lenders. While the former grants these low income families easy access to cash, these services come with a higher risk and more often than not, carry higher costs in the long run⁸. With the ability to accrue wealth and assets impaired, lower income households are consequently unable to build up a credit history, further limiting themselves from other traditional financial services.

⁵ Appaya, S. (2021). On fintech and financial inclusion. Retrieved 6 April 2022, from <https://blogs.worldbank.org/psd/fintech-and-financial-inclusion>

⁶ Ibid

⁷ Rubstova, V. (2019). Banking and Poverty: Why the Poor Turn to Alternative Financial Services. Retrieved 6 April 2022, from <https://econreview.berkeley.edu/banking-and-poverty-why-the-poor-turn-to-alternative-financial-services/>

⁸ Sawyer, N., & Temkin, K. Analysis of Alternative Financial Service Providers (p. 1). Fannie Mae Foundation. Retrieved from <https://www.urban.org/sites/default/files/alfresco/publication-pdfs/410935-Analysis-of-Alternative-Financial-Service-Providers.PDF>

Credit scoring has traditionally been recognised as an essential tool for sound lending through accurately measuring and pricing risk over time. Other than the lack of income, the lower income population face significant challenges accessing credit due to their inability to build a good credit history. Oftentimes, they are imposed exceptionally high interest rates, or are fully denied credit by traditional financial institutions.

Being shut out of the traditional credit system can have imposing consequences on different aspects of their lives. Without creditworthiness, individuals and households are not able to access mortgages, car loans and other debt⁹. More importantly, where more than 30 percent of adults in Cambodia, Guinea, Madagascar, Sudan and the Republic of Yemen have indicated that emergency and health reasons are the most common reason for having an outstanding loan¹⁰, the lack of access to sufficient credit can limit the access to medical services. Traditional financial institutions have limited appetite to extend credit to vulnerable groups¹¹, including the low-income and women because of a lack of customer data and history to assess their creditworthiness. This further puts the at-risk group in a position of exploitation, as they end up turning to unregulated players with predatory interest rates. Unsurprisingly, many remain caught in the bad credit cycle, unable to break free from defaulting on more and more payments.

Furthermore, in other developing regions around the world, Micro, Small and Medium Enterprises (MSMEs) rely on their creditworthiness to tap on lines of credit to allow their businesses to survive. In Southeast Asia, only approximately 33% of businesses have access to proper financing¹². Without demonstrable creditworthiness and the lack of any deposits and properties as collateral, they are likely to be denied a line of credit. This inaccessibility to tap on a line of credit severely limits their growth potential – MSMEs often have to decline profitable opportunities that come along their way due to their lack of capital, and face disadvantageous payment terms when negotiating with larger debtors.

⁹ Reinicke, C. (2022). There have never been more ways to build a credit score. Here's what to know. Retrieved 6 April 2022, from <https://www.cnbc.com/2022/02/03/there-have-never-been-more-ways-to-establish-and-build-a-credit-score.html>

¹⁰ Demircuc-Kunt, A., & Klapper, L. (2012). Measuring Financial Inclusion: The Global Findex Database. Policy Research Working Papers, 39. doi: 10.1596/1813-9450-6025

¹¹ Oliver Wyman. (2022). Accelerating Financial Inclusion in South-east Asia with Digital Finance. Asian Development Bank. Retrieved from <https://www.adb.org/sites/default/files/publication/222061/financial-inclusion-se-asia.pdf>

¹² Tan, Y. (2018). How Digital Disruptors Serve The Unbanked In Southeast Asia. Retrieved 6 April 2022, from <https://www.forbes.com/sites/tanyinglan/2018/10/02/how-digital-disruptors-serve-the-unbanked-in-southeast-asia/?sh=159a89f120be>

Without a stable revenue stream amid the surmounting business expenses, cash-strapped MSMEs have no choice but to undertake

credit with skyrocketing interest rates – about 10% to 50% of the loan amount in a single transaction¹³. At the same time, the sluggish underwriting processes from traditional financial institutions and the absence of government guidance on compliance paperwork further exacerbates the situation. To financially empower these MSMEs and help them grow organically, there is more to be done to redefine the existing credit scoring system and spearhead responsible economic enablement.

Lack of necessary documentation

The World Bank estimates that an approximate one billion people globally lack an official foundational identification¹⁴. Without identification in the form of passports and identification cards, they are unable to be accurately authenticated, prohibiting them from accessing basic economic opportunities.

In the 2017 Global Findex Database published by the World Bank, it was stated that the lack of documentation was a critical barrier to accessing financial services. In fact, this barrier was more conspicuous for the marginalised segments of the society, which include women, rural farmers, migrants, refugees and stateless persons¹⁵.

Consequently, this creates an entry cost friction in the process of obtaining credit¹⁶. The barring documentation requirements largely comprise of standard Know-Your-Customer (KYC) requirements in compliance with the global Anti Money Laundering and Counter-Financing Terrorism (AML/CFT) guidelines in a bid to reduce improve financial transparency and governance.

Many developing countries have introduced such requirements as a result. For Brazilian banks, basic savings accounts keep KYC requirements at a minimum, which are otherwise known as “simplified

¹³ Carandang, B. (2019). How fintech is setting Southeast Asia's SMEs free. Retrieved 6 April 2022, from <https://www.weforum.org/agenda/2019/06/fintech-is-driving-financial-inclusion-in-southeast-asia/>

¹⁴ Appaya, S., & Varghese, M. (2019). Digital ID – a critical enabler for financial inclusion. Retrieved 6 April 2022, from <https://blogs.worldbank.org/psd/digital-id-critical-enabler-financial-inclusion>

¹⁵ Why ID matters for development. Retrieved 6 April 2022, from <https://id4d.worldbank.org/guide/why-id-matters-development>

¹⁶ Barajas, A., Beck, T., Belhaj, M., & Ben Naceur, S. (2020). Financial Inclusion: What Have We Learned So Far? What Do We Have to Learn?. IMF Working Papers, 20(157). doi: 10.5089/9781513553009.001

accounts¹⁷. Halfway across the world in India, the Aadhar program implemented in 2009 introduced a biometrically-verifiable identification

number to all citizens¹⁸. While the Financial Action Task Force has also recognised the unintended consequences brought about by the stringent AML/CFT guidelines, they have reiterated the need to ensure that systemic safeguards are introduced to support overall financial inclusion.

As much as it is encouraging to see various digital identity frameworks being rolled out by government bodies across the world, financial

exclusion undoubtedly remains a threat to the economic freedom of one-seventh of the world's population.

Lack of infrastructure to access financial services

In the same 2017 Global Findex Survey by the World Bank, 20 percent of respondents voiced physical distance as a reason for not having a bank account. This reason was also cited more frequently in developing countries where financial services access points are more remote¹⁹.

Over the past decade, "branchless banking" has seen successes in increasing financial access in developing economies²⁰. In essence, the former include stationary bank agents operating out of nearby retail stores, gas stations and post offices; as well as mobile agents who make rounds among clients²¹. However, there is a limit to how cost-efficient the practice can expand financial access.

Mobile banking developments and the internet have thus opened up new channels for greater accessibility to formal financial services. According to the BIS, greater access to financial services is expected to

¹⁷ Alliance for Financial Inclusion (AFI). (2019). KYC Innovations, Financial Inclusion and Integrity In Selected AFI Member Countries. Alliance for Financial Inclusion (AFI). Retrieved from <https://www.afi-global.org/sites/default/files/publications/2019-03/KYC-Innovations-Financial-Inclusion-Integrity-Selected-AFI-Member-Countries.pdf>

¹⁸ Perrigo, B. (2018). India Has Been Collecting Eye Scans and Fingerprint Records From Every Citizen. Here's What to Know. Retrieved 6 April 2022, from <https://time.com/5409604/india-aadhaar-supreme-court/>

¹⁹ Camara, N., & Tuesta, D. (2014). Measuring Financial Inclusion: A Multidimensional Index. SSRN Electronic Journal. doi: 10.2139/ssrn.2634616

²⁰ Mahmood, R., & Sarker, S. (2015). Inclusive Growth through Branchless Banking: A Review of Agent Banking and its Impact. *Journal Of Economics And Sustainable Development*, 6(23).

²¹ Caputo, S. (2019). The pivotal role of mobile money agents in driving financial inclusion. Retrieved 6 April 2022, from <https://www.gsma.com/mobilefordevelopment/blog/the-pivotal-role-of-mobile-money-agents-in-driving-financial-inclusion/>

foster financial inclusivity through greater availability that meets the needs of the population. Technological innovations and fintech advancements are therefore expected to overcome the barrier of geographical distance and increase the share of adults holding a formal bank account by up to 23 percentage points in Sub-Saharan Africa and 14 percentage points in South Asia²².

Overall, we observe the unparalleled potential for fintech to increase financial inclusion in rural and hard-to-reach areas.

²² Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2018). Measuring Financial Inclusion and the Fintech Revolution (p. 35). World Bank Group. Retrieved from https://globalfindex.worldbank.org/sites/globalfindex/files/2018-04/2017%20Findex%20full%20report_0.pdf

Business Case for Financial Inclusion

Financial inclusion creates an interesting business opportunity for many stakeholders in the economy. Oxford Economics estimates that serving the unbanked could potentially add upwards of \$250 billion to the global Gross Domestic Product²³. Indeed, substantial social and business benefits can be unravelled through tapping on this otherwise lucrative market. The accelerating transformation of fintech, digital and mobile banking raises efficiency, lowers transaction costs and expands outreach to lower market segments. Necessitated by the COVID-19 pandemic, this digital transformation of the landscape has disrupted the high costs of customer acquisitions, credit scoring and credit underwriting processes; whilst remodelling the cross selling of products by traditional intermediaries.

Digital Financial Services

Financial service providers stand to gain from the democratisation of financial products. By serving the currently-unbanked businesses and populations around the world, banks stand to bring in an additional \$380 billion in annual market revenues - global technology consultancy Accenture and leading humanitarian organisation CARE International finds²⁴. Out of the whopping \$380 billion tag, closing the MSME credit gap and introducing fee-based services could rake in approximately \$270 billion in additional revenue. Separately, \$110 billion could be generated in the process of engaging unbanked adults into the existing financial system.

While the economics of financial inclusion show a promising value proposition to large institutional players, the main roadblock lies in the outdated perspective of incumbents. Thus far, the financial inclusion agenda has always been viewed to be a low-end, unprofitable and purely philanthropic segment. The push for creating innovative and inclusive financial products has often been driven through corporate social responsibility incentives and external regulatory pressures.

Despite this, there is cause to remain optimistic about the potential of digital financial services. According to strategy house McKinsey, digital finance is estimated to reach over 1.6 billion retail consumers in several

²³ Oxford Economics. (2019). The 'YES' Economy: Giving the world financial identity. Oxford Economics. Retrieved from <https://www.oxfordeconomics.com/resource/The-YES-Economy-Giving-the-world-financial-identity/>

²⁴ Accenture. Within Reach: How banks in emerging economies can grow profitably by being more inclusive. CARE International. Retrieved from <https://care.ca/wp-content/uploads/2018/12/Accenture-Banking-WithinReach.pdf?x77159>

developing economies²⁵. At the same time, the global volume of loans is expected to increase by \$2.1 trillion when digital financial services are tapped on. Financial services providers are the first in line to benefit from this opportunity as they expand their existing revenue streams and introduce more product offerings aligned with the changing demands in the overarching landscape. Other ecosystem players stand to gain as well – new businesses offering data-based services, microfinancing services, and other novel products will spring up and disrupt the status quo.

Mobile money economics

The proliferation of mobile technology has allowed for the provision of live mobile money services across various regions over the past ten years²⁶. In the backdrop of increasing mobile penetration in several developing and fast-growing economies, the ubiquity of mobile phones has been a key enabler for the underbanked to gain a secure and affordable means of transfer and payment. With just a mobile phone application and a SIM card, anyone can register an account with the financial service provider and deposit cash for electronic money. This makes mobile banking an affordable and even more accessible counterpart to the commonplace agent banking model.

Currently, half of the global mobile money transactions are centred in Africa²⁷. In fact, mobile money has become so commonplace in the majority of the underbanked and unbanked areas that, in 2020, Africans exchanged a whopping \$490 billion through mobile money providers²⁸. Taking an example, the implementation of a new mobile banking service has allowed the Zambia National Commercial Bank to now

²⁵ Osafo-Kwaako, P., Singer, M., White, O., & Zouaoui, Y. (2018). Mobile money in emerging markets: The business case for financial inclusion. Retrieved 6 April 2022, from

<https://www.mckinsey.com/industries/financial-services/our-insights/mobile-money-in-emerging-markets-the-business-case-for-financial-inclusion>

²⁶ Aron, J., & Muellbauer, J. (2019). The economics of mobile money: Harnessing the transformative power of technology to benefit the global poor. Retrieved 6 April 2022, from <https://voxeu.org/article/economics-mobile-money#:~:text=Every%20deposit%20withdrawal%20transfer%20or,remittances%20more%20affordable%20and%20traceable>

²⁷ Mureithi, C. (2021). Africa continues to be the global leader in mobile money services. Retrieved 6 April 2022, from <https://qz.com/africa/1990532/africa-continues-to-be-the-global-leader-in-mobile-money-services/>

²⁸ Zandt, F. (2021). Where is 'mobile money' being used the most?. Retrieved 6 April 2022, from <https://www.weforum.org/agenda/2021/09/mobile-money-africa-prevalence-economics-technology/>

serve 200,000 more customers²⁹. The entry-level mobile account introduced, Xapit, offers minimal account fees and the optionality of an accompanying debit card. It is unsurprising that Xapit has been well-received domestically, given that over half of all Zambians own a mobile phone³⁰.

Asia takes the second spot as it accounts for over a quarter of the world's mobile money services³¹. Out of the 547 million mobile money accounts registered in Asia, more than half of these accounts are traced to users in South Asia³². With the regional transaction volume more than doubling in the past few years, it is no wonder that tech firms have been disrupting the traditional banking landscape in Southeast Asia³³. In Indonesia, non-banks have already taken over primary payment providers. Similarly, non-banks have also been experiencing an exponential growth trajectory in the Philippines³⁴. With an estimated 290 million market size for the unbanked within the ASEAN region³⁵, there has never been a better incentive for new fintech players to ride on the mobile money economy and challenge the existing infrastructure.

²⁹ Mastercard Foundation. Digital Access: The Future of Financial Inclusion in Africa. International Finance Corporation (IFC). Retrieved from https://www.ifc.org/wps/wcm/connect/96a4f610-62b1-4830-8516-f11642cfeafd/201805_Digital-Access_The-Future-of-Financial-Inclusion-in-Africa_v1.pdf?MOD=AJPERES&CVID=mdz-QF0

³⁰ O'Dea, S. (2021). Zambia mobile cellular subscriptions 2000-2020. Retrieved 6 April 2022, from <https://www.statista.com/statistics/501173/number-of-mobile-cellular-subscriptions-in-zambia/>

³¹ GMSA (2021). State of the Mobile Money Industry in Asia. (2021). Presentation. Retrieved from <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2021/07/State-of-the-Mobile-Money-Industry-in-Asia-1.pdf>

³² Ibid

³³ Ibid

³⁴ Nariyanuri, S. (2021). Southeast Asia E-Money Market Report. S&P Global Market Intelligence. Retrieved from <https://pages.marketintelligence.spglobal.com/SEA-E-Money-Report-2021-Report-Request.html>

³⁵ FitchRatings. (2020). Digital Banks in South-East Asia. FitchRatings. Retrieved from <https://www.fitchratings.com/research/banks/digital-banks-in-south-east-asia-19-08-2020>

Governance Case for Financial Inclusion

Across the world, inclusive growth has become one of the most prominent policy goals for governments. While financial inclusion is just one of many items on the inclusion agenda, the term has gained significant traction since the early 2000s. Financial inclusion drives seven of the United Nations Sustainable Development Goals (UN SDG), facilitating the universal goal of poverty reduction and global economic prosperity. Since then, governments have since recognised the urgent need to extend access to financial services across all segments of society. Globally, over 60 countries have made commitments to financial inclusion, and more than 50 countries have embarked upon national financial inclusion strategies to prioritise financial inclusion³⁶.



From the perspective of a policymaker, financial inclusion is imperative to poverty reduction and reducing socioeconomic costs on existing infrastructure. It is also key to promoting equity and a higher standard of living. To bridge the financial infrastructure gap, governments take on the role to stimulate infrastructural growth, catalyse volume and implement shared rules for adherence.

Regionally, governments have been actively promoting infrastructure through means such as taking on ownership of several retail points of services, introducing national payments and financial switches, and removing overarching barriers to financial access.

The Indonesian government has been active in their efforts to promote financially inclusive infrastructure. A successful example in promoting infrastructure is the Indonesian government's TabunganKu BCA initiative in 2010. A savings product that targets the lowest

³⁶ Senay, R. (2021). How Financial Inclusion is Driving Fairer Growth in Emerging Markets. Retrieved 6 April 2022, from https://www.lazardassetmanagement.com/uk/en_uk/references/fundamental-focus/financial-inclusion

denominator of migrant worker groups and societal groups in remote areas³⁷, run jointly by several banks in Indonesia, the program only requires Rp 20,000 for a starting balance and removes monthly administration costs charged by a traditional financial institution³⁸. However, there is an impediment to widespread usage – any transactions made through the TabunganKu account can only be performed in a bank branch. Yet, there are only 10 bank branches available to 100,000 Indonesians at any time³⁹, one of the lowest amongst its neighbouring countries.

Promoting infrastructure can also take the form of introducing national microfinancing schemes. Thailand's Village Fund has become one of the most prominent microfinance institutions globally, and is the second-largest microcredit scheme in the world⁴⁰. The programme sets up a one million baht loanable fund per village⁴¹. Ideally with a standard pool of loanable funds per village, entrepreneurs MSMEs can grow and sustain their businesses, contributing to a stronger economy within each precinct. However, effects varied across different segments. While overall agricultural income increased, the overall asset growth in villages declined⁴².

At the same time, governments play a significant role in implementing rules that determine whom, how, and when can undertake initiatives and programmes to promote financial inclusivity. In fact, governments can be said to be the sole regulator in admitting new entrants into the financial services sector – and by proxy, determine how ecosystem changes will unfold.

The capacity of governments in being the payment systems overseer can be observed through the entry of the most notable non-bank e-money platforms in the Filipino market, Gcash. Now the country's largest mobile e-wallet service, the non-bank payment system takes on market leadership as over 70 percent of Filipino adults have a Gcash

³⁷ Bank Indonesia (n.d.) Financial Inclusion Development Policy in Indonesia. Presentation, Indonesia. Retrieved from https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---ilo-jakarta/documents/presentation/wcms_216688.pdf

³⁸ Santoso, A. (2014). Analysis: Financial inclusion through government aid programs. Retrieved 6 April 2022, from <https://www.thejakartapost.com/news/2014/09/17/analysis-financial-inclusion-through-government-aid-programs.html>

³⁹ Commercial bank branches (per 100,000 adults) - Indonesia. Retrieved 6 April 2022, from <https://data.worldbank.org/indicator/FB.CBK.BRCH.P5?locations=ID>

⁴⁰ Boonperm, J., Haughton, J., Khandker, S., & Rukumnuaykit, P. (2012). Appraising the Thailand Village Fund. Policy Research Working Papers. doi: 10.1596/1813-9450-5998

⁴¹ Kislat, C., & Menkhoff, L. (2013). The Village Fund Loan Programme: Who Gets It, Keeps It and Loses It?. *Vulnerability To Poverty*, 283-304. doi: 10.1057/9780230306622_11

⁴² Dizikes, P. (2022). Taking Credit. Retrieved 6 April 2022, from <https://news.mit.edu/2012/thai-village-0510>

account⁴³. In 2009, presented with two e-money schemes, the Filipino regulators, the central bank of the Philippines, Bangko Sentralng Pilipinas (BSG) had issued an operating licence to Gcash, in lieu of another bank-issued e-money product, Smart Money, which was introduced by a traditional financial institution. Gcash had an interesting value proposition – to be able to reach the unbanked and underbanked populations in the country and therefore fulfil the gap in e-wallet services. The introduction of Gcash's frictionless application and overall ease-of-use was a better alternative to traditional financial services which had barriers to entry, with multiple documentation requirements, demonstrable credit records and high minimum balances required⁴⁴. A decade later, this regulatory action had pronounced effects in transforming the financial services landscape. Gcash has set a precedent to fintech companies overtaking banks in capturing the unbanked populations⁴⁵. Regulations had effectively created a level playing field between nonbanks and banks⁴⁶ – and therefore a more dynamic ecosystem of different actors and products with an objective of democratising finance.

Undoubtedly, successes globally have been varied. Countries with more advanced and efficient banking systems have seen greater success in their initiatives. Large variations observed in the range and depth of financial services were observed to be attributed to the market frictions that hinder the efficient operations of financial institutions and markets⁴⁷. The existence of market and regulatory constraints constitute country-specific barriers that contribute to market frictions. Naturally, efficient and developed financial sectors allow greater competition to materialise, ensuring that there is a competitive supply of financial services to expand and entrench accessible financial and lending infrastructure⁴⁸.

⁴³ GCash Sustains Growth and Market Leadership with over 51 Million Users as of End-October. (2021). Retrieved 6 April 2022, from <https://www.globe.com.ph/about-us/newsroom/partners/gcash-sustains-growth-market-leadership.html#gref>

⁴⁴ Financial services are experiencing massive adoption in the Philippines through Gcash. (2021). Retrieved 6 April 2022, from <https://www.hubdis.com/news/financial-services-are-experiencing-massive-adoption-in-the-philippines-through-gcash>

⁴⁵ Cigaral, I. (2021). Fintech firms to overtake banks in cornering unbanked Filipinos – Moody's. Retrieved 6 April 2022, from <https://www.philstar.com/business/2021/07/15/2112718/fintech-firms-over-take-banks-cornering-unbanked-filipinos-moodys>

⁴⁶ Ehrbeck, T., Pickens, M., & Tarazi, M. (2012). Financially Inclusive Ecosystems: The Roles of Government Today. CGAP. Retrieved from <https://www.cgap.org/sites/default/files/Focus-Note-Financially-Inclusive-Ecosystems-The-Roles-of-Government-Today-Feb-2012.pdf>

⁴⁷ Ayyagari, M., & Beck, T. (2015). Financial Inclusion in Asia: An Overview. Asian Development Bank. Retrieved from <https://www.adb.org/sites/default/files/publication/173377/ewp-449.pdf>

⁴⁸ Asian Development Bank Institute. (2014). Financial Inclusion in Asia: Country Surveys. Asian Development Bank Institute. Retrieved from <https://www.adb.org/sites/default/files/publication/159308/adbi-financial-inclusion-asia.pdf>

After all, strong government support and an enabling environment remains key to establishing a financially inclusive society. Governments can seek to achieve financial inclusion by putting in place open regulatory policies that welcome the entry of innovative fintech solutions. For instance, the implementation of regulatory sandboxes ensure that market entrants have a safe space to test their products, services and solutions before going into the market⁴⁹. A positive, enabling environment that balances responsible and well-informed initiatives will be crucial to achieve greater financial inclusion.

⁴⁹ Baker McKenzie. A Guide To Regulatory Fintech Sandboxes Across Asia Pacific. Baker McKenzie. Retrieved from https://www.bakermckenzie.com/-/media/files/insight/publications/2018/01/qrg_ap_regulatoryfintech_jan18.pdf?la=en

AI

While the definition of artificial intelligence (AI) has been reimagined over the past century, it can simply be explained to be the endeavour to simulate human intelligence in machines through complex mathematical modelling techniques⁵⁰. Machine learning is thus the application of AI to develop models and algorithms to solve problems⁵¹. Built from data, the performance of machine learning algorithms are largely correlated to the quality of the dataset⁵² - and this has implications on its corresponding applications. Today, AI and machine learning applications can be extended to the financial inclusion agenda, and have increasing relevance in the field of credit risk scoring.

In economies where financial mobility of the already vulnerable groups are impeded, artificial intelligence (AI) and machine learning serve as welcome technologies that can improve their access to basic financial services.

Information asymmetry and its barrier to extending credit

The credit market is largely characterised by information asymmetry. Banks, as their capacity as lenders, do not always possess perfect information on the borrower's risks, as posited by Stiglitz and Weiss (1981)⁵³. For the financially vulnerable, being excluded from the formal employment economy and the lack of a pre-existing account with traditional financial institutions further contribute to their information opacity. Similarly, MSMEs who do not have audited financial statements and lack any collateral to tag to their loan applications also make their characteristics much harder to capture in quantitative indicators as required by financial institutions⁵⁴. This creates the financial inclusion gap that could be largely resolved through technologies that can bridge the existing information asymmetry.

⁵⁰ What is Artificial Intelligence? How Does AI Work?. Retrieved 6 April 2022, from <https://builtin.com/artificial-intelligence>

⁵¹ Marr, B. (2016). What Is The Difference Between Artificial Intelligence And Machine Learning?. Retrieved 6 April 2022, from <https://www.forbes.com/sites/bernardmarr/2016/12/06/what-is-the-difference-between-artificial-intelligence-and-machine-learning/?sh=3b0c65bf2742>

⁵² Mhlanga, D. (2021). Financial Inclusion in Emerging Economies: The Application of Machine Learning and Artificial Intelligence in Credit Risk Assessment. *International Journal Of Financial Studies*, 9(3), 39. doi: 10.3390/ijfs9030039

⁵³ Stiglitz, J., & Weiss, A. (1981). Credit Rationing in Markets with Imperfect Information. *The American Economic Review*, 71(3), 393-410. doi: <http://www.jstor.org/stable/1802787>

⁵⁴ Barajas, A., Beck, T., Belhaj, M., & Ben Naceur, S. (2020). Financial Inclusion: What Have We Learned So Far? What Do We Have to Learn?. *IMF Working Papers*, 20(157). doi: 10.5089/9781513553009.001

Redefining credit scoring through the use of AI and alternative data

Where the main barrier for the financially vulnerable to access credit products often lie in their inability to demonstrate creditworthiness as obligated by traditional financial institutions, AI can step in by calculating credit scores through machine learning algorithms that utilises alternative data – enhancing the existing credit scoring mechanisms to include the underserved into the credit system.

Alternative credit scoring utilises artificial intelligence and social media, scraping away traditional metric and paper-based scoring methodologies that depend on individuals having a preexisting account. In many developing economies, consumers tend to prefer one-stop-shops to make their necessary purchases. In Indonesia, e-commerce has become the most prevalent platform for the retail consumer to top up their phone credit, pay bills, and pay for their commute⁵⁵. At the same time, the unbanked in the society also typically are unable to demonstrate a consistent income history or creditworthiness, being traditionally cash intensive users⁵⁶.

This provides AI-based fintech firms an interesting opportunity. By onboarding the unbanked into the e-commerce and online platforms, there are now data points for their algorithm to evaluate their financial and consumption fitness. Similarly, alternative data sources such as public data, registered data from companies and interaction data from social media and messenger services can enrich the alternative credit scoring dataset to enable the AI algorithm to assess consumer behaviour and verify their ability to repay the loans more accurately⁵⁷.

The technology is already in place in some key emerging markets. Branch, a mobile-based digital lending application provides consumers in Kenya, Mexico, Nigeria, India and Tanzania access to instant loans with no physical documentation⁵⁸. Credit is made affordable and

⁵⁵ Widiyasari, V., & Widjaja, H. (2021). This new approach to credit scoring is accelerating financial inclusion in emerging economies. Retrieved 6 April 2022, from <https://www.weforum.org/agenda/2021/01/this-new-approach-to-credit-scoring-is-accelerating-financial-inclusion/>

⁵⁶ Cuevas, L. (2020). AI for Financial Inclusion: Banking the Unbanked. Retrieved 6 April 2022, from <https://blog.strands.com/ai-for-financial-inclusion-banking-the-unbanked#:~:text=The%20application%20of%20artificial%20intelligence,being%20mostly%20cash%20intensive%20users>

⁵⁷ Mhlanga, D. (2021). Financial Inclusion in Emerging Economies: The Application of Machine Learning and Artificial Intelligence in Credit Risk Assessment. *International Journal Of Financial Studies*, 9(3), 39. doi: 10.3390/ijfs9030039

⁵⁸ Margarete, B., & O'Neill, F. (2022). Artificial Intelligence Innovation in Financial Services. Retrieved from <https://openknowledge.worldbank.org/handle/10986/34305>

accessible to the financially vulnerable, including smallholder farmers which have difficulties accessing credit from traditional financial services providers. The application incorporates machine learning algorithms to assess the creditworthiness of the borrower through data points gathered from the individual borrower as well as those pegged to the accumulated experiences of other existing borrowers. Branch collects mobile data ranging from text messages to call logs and even GPS information to derive its credit decision. The onboarding process is frictionless as well – applicants simply have to download the application, perform standard identification verification processes and indicate their consent for Branch to access their mobile phone data. Furthermore, Branch extends credit in denominations as low as USD \$50⁵⁹, breaking down traditional notions of economies of scale as necessitated in traditional financial institutions.

In a way, alternative credit scoring is simply an upgrade from traditional credit evaluation mechanisms to automated credit scoring in the presence of abundant, relevant and quality consumer data; which is otherwise known as alternative data. And yet, alternative credit scoring serves as a more efficient, cost-effective and customised alternative to include the financially vulnerable into the system; overcoming the problem of information asymmetry⁶⁰.

⁵⁹ Ibid

⁶⁰ Kaya, D., & Pronobis, P. (2016). The Benefits of Structured Data across the Information Supply Chain: Initial Evidence on XBRL Adoption and Loan Contracting of Private Firms. *Journal Of Accounting And Public Policy*, 35(4). doi: 10.2139/ssrn.2450858

Blockchain

The blockchain is simply a massive, decentralised ledger of transactions across a peer-to-peer network⁶¹. The shared and immutable ledger enables the processing of transactions and tracking of assets without the need for a central authority or bank as an intermediary⁶², extending its uses beyond the more commonly known cryptocurrency. Distributed ledger technology is one of such applications that can help to foster financial inclusion⁶³.

A case for accessibility and usability

Conventionally, the unbanked and underbanked face significant challenges and hefty costs in opening a bank account. Other than a potentially long travel time and opportunity costs in heading to a bank branch, identification documents and a minimum initial deposit balance are also some of the key barriers.

Blockchain technologies have the potential to make the financial services ecosystem more transparent, frictionless and efficient. Operating on a wholly online presence, individuals do not need to travel to a bank branch to open an account or to deposit cash. Furthermore, in terms of usability, they are also able to deposit money into their accounts through third party agents right on their phone. This makes their access to the financial system seamless. However, this is not the sole value proposition of blockchain technology.

Blockchain-based identities help address the hurdle on identification documents. One billion in the world lack proof of identity and struggle to face challenges in verifying and authenticating their identities⁶⁴. This restricts their access to many basic services and opportunities – financial, health and livelihood. Without legal identification, they are denied access to formal employment, registering self-owned businesses, opening a bank account, accessing healthcare and even

⁶¹ Powell, A. (2021). Cryptocurrency expert discusses recent fluctuations. Retrieved 6 April 2022, from <https://news.harvard.edu/gazette/story/2021/06/cryptocurrency-expert-discusses-recent-fluctuations/#:~:text=For%20the%20uninitiated%2C%20cryptocurrencies%20are,that%20keeps%20track%20of%20transactions>

⁶² James, H. (2022). Lucre's Allure. Retrieved 6 April 2022, from <https://www.imf.org/external/pubs/ft/fandd/2018/06/bitcoin-blockchain-history-of-money/james.htm#:~:text=Blockchain%20technology%20means%20that%20value,interaction%20of%20machines%20and%20energy>

⁶³ Bouveret, A., & Haksar, V. (2018). What Are Cryptocurrencies?. Retrieved from <https://www.imf.org/external/pubs/ft/fandd/2018/06/what-are-cryptocurrencies-like-bitcoin/basics.htm>

⁶⁴ Desai, V., Diofasi, A., & Lu, J. (2018). The global identification challenge: Who are the 1 billion people without proof of identity?. Retrieved 7 April 2022, from <https://blogs.worldbank.org/voices/global-identification-challenge-who-are-1-billion-people-without-proof-identity>

obtaining government aid. This makes a strong case for a verifiable digital ID, which can be registered at a lower cost⁶⁵. Blockchain provides an effective proposition to digital identity management.

Without requiring the typical legacy documentation from traditional financial systems, the technology could help the unbanked become more easily verifiable on public blockchains. If the unbanked are able to gain access to the internet, they are surely able to access blockchains. Similarly, if they are able to access blockchains, they now have a digital identity in the form of a decentralised identifier (DID)⁶⁶. This allows individuals without proper access to the financial system to gain a higher independence and better chances of government welfare through their digital identity on blockchain⁶⁷. These unique identifiers are generated and controlled by holders, in so-called decentralised self-sovereign identity (SSI) systems – immutable and more secure than traditional identity systems⁶⁸. It allows an individual to have control over the administration of his identity – users can now carry their own tangible digital ID to access services such as transferring money over a domestic and international scale⁶⁹.

As such, self-sovereign identity platforms are easily accessible to any mobile phone holder – the unbanked would just be required to open an account and input the necessary data to create the digital ID. This is well-aligned with the ubiquity of mobile and internet usage across the world.

Blockchain-based identities empower individuals. Individuals remain in sole control of their own identity, and with the immutability of the underlying blockchain technology, their identity cannot be owned by any governmental authority and financial intermediaries. Predictably, decentralised identity solutions will benefit refugees without proper

⁶⁵ Mahajan, D., Manyika, J., & White, O. (2019). Nearly one billion people have no form of legal ID. Retrieved 7 April 2022, from <https://www.mckinsey.com/mgi/overview/in-the-news/nearly-one-billion-people-have-no-form-of-legal-id>

⁶⁶ Sporny, M., Longley, D., Sabadello, M., Reed, D., Steele, O., & Allen, C. (2021). Decentralized Identifiers (DIDs) v1.0 Core architecture, data model, and representations. W3C Proposed Recommendation. doi: [https://www.w3.org/TR/did-core/#:~:text=Decentralized%20identifiers%20\(DIDs\)%20are%20a,the%20controller%20of%20the%20DID](https://www.w3.org/TR/did-core/#:~:text=Decentralized%20identifiers%20(DIDs)%20are%20a,the%20controller%20of%20the%20DID)

⁶⁷ Baruri, P. (2016). Blockchain Powered Financial Inclusion. Presentation. Retrieved from <https://afyonluoglu.org/PublicWebFiles/Reports/Blockchain/WB/2016%20WB%20-%20Blockchain%20Powered%20Financial%20Inclusion.pdf>

⁶⁸ Blockchain for Digital Identity. Retrieved 7 April 2022, from <https://www.nec.com/en/global/solutions/blockchain/blockchain-for-digital-identity.html#:~:text=Blockchain%20has%20facilitated%20the%20so,connect%20to%20different%20online%20services>

⁶⁹ Spilka, D. (2020). Blockchain and the unbanked: Changes coming to global finance. Retrieved 7 April 2022, from <https://www.ibm.com/blogs/blockchain/2020/03/blockchain-and-the-unbanked-changes-coming-to-global-finance/>

identification documents the most⁷⁰, providing them with a digital verification mechanism to prove and share their identities⁷¹, enabling them access to basic services. Beyond that, blockchain-based identities serve to include the financially vulnerable on a larger scale, providing them with an economic identity through a public decentralised infrastructure⁷².

Redefining digital credit and capital raising

The global online alternative finance market volume has increased by a whopping 37 percent from 2012 to 2017. In 2017, the total market volume stands at \$418.52 billion⁷³. Under the umbrella of online alternative finance, peer-to-peer (P2P) lending and crowdfunding has seen a continuous growth trajectory. Unsurprisingly, the push for P2P lending and crowdfunding has been marked by the underlying demand for greater credit accessibility by small businesses.

While still a relatively nascent industry, P2P lending provides significant potential in contributing to the growth of many MSMEs. Globally, P2P lending accounts for 25 percent of MSMEs' funding mechanism⁷⁴. MSMEs in Indonesia face obstacles and limited access to funding from formal funding, making it challenging for their businesses to expand and survive⁷⁵. At the same time, they are vital to Indonesia's economy, contributing to job creation, poverty reduction, and solving inequality. Where P2P lending is seen as a more convenient, efficient and flexible alternative to traditional financing, the P2P lending market steps in as one of the most important sources of funding for these businesses.

⁷⁰ Karanja, R., & Korin, N. (2019). Blockchain-based Digital ID Platform for Refugee Camps in Kenya. Retrieved from <https://bteam.org/assets/reports/Blockchain-Based-Digital-ID-Platform-for-Refugee-Camps-in-Kenya.pdf>

⁷¹ Morrow, M. The Promise of Blockchain and Safe Identity Storage for Refugees. Retrieved from <https://www.unhcr.org/blogs/promise-hype-provides-blockchain-safe-identity/>

⁷² Lim, E. (2021). Decentralised identity: first step towards banking the unbanked. Retrieved 7 April 2022, from <https://www.businessthink.unsw.edu.au/articles/decentralised-identity>

⁷³ Cambridge Centre for Alternative Finance. The Landscape of Peer to Peer / Marketplace Lending. Cambridge Centre for Alternative Finance. Retrieved from <https://thedocs.worldbank.org/en/doc/382571560127611420-0130022019/original/FinSACFintech19KieranGarvey.pdf>

⁷⁴ SME Finance Working Group. (2020). Survey Report on Alternative Finance for SMEs. Alliance for Financial Inclusion. Retrieved from https://www.afi-global.org/wp-content/uploads/2021/01/AFI_MSMEs_survey-report_AW_digital_0.pdf

⁷⁵ Tambunan, T., Santoso, W., Busneti, I., & Batunanggar, S. (2021). The Development of MSMEs and the Growth of Peer-to-Peer (P2P) Lending in Indonesia. *International Journal Of Innovation, Creativity And Change*, 15(2), 585-611. Retrieved from https://www.ijicc.net/images/Vol_15/Iss_2/15238_Tambunan_2021_E2_R1.pdf

As the P2P lending market continues to scale up, blockchain technology has the potential to be implemented in P2P lending platforms to help facilitate safer, more transparent and quicker access to funds⁷⁶. The role of the blockchain-based P2P platform is not that of a credit intermediary, but rather as an information intermediary to connect supply and demand resources (i.e. or borrowers and lenders). The platform facilitates transaction initiation, pre-transaction verification, contract signing, transaction processing and risk control⁷⁷.

In transaction initiation, both borrowers and lenders download the blockchain client. Synchronising their devices to the blockchain network, the borrower proceeds to request for financing at the terminal with the amount, maturity, interest rate, collaterals and other relevant information. The lender mobilises the borrower's credit history in the blockchain platform and proceeds to make the credit decision through direct P2P communication. Verification takes place in the form of fuss-free, quick, real-time authentication and approval without the involvement of a third party. The use of smart contracts comes in to enable contract signing without the need of brokers and intermediaries, enabling greater speed, accuracy and safety in processing⁷⁸. To finish off, the client wallet is then utilised to transfer the money and to synchronise information in real time, without account processing. All transaction information and protocols are publicly recorded on the ledger – information ascribed on each block is available on all nodes and visible throughout the entire network.

Blockchain P2P lending provides substantial cost efficiencies and onboarding time. For instance, by removing intermediaries in loan closing, the technology can help save 1 to 2 percent of the closing costs⁷⁹. This makes P2P lending much more affordable and scalable to the underserved. Furthermore, as the blockchain saves the full credit history of borrowers, future lenders are provided a degree of oversight on their creditworthiness⁸⁰. This is a welcome innovation to the financially vulnerable, as they are often unable to demonstrate

⁷⁶ Gonzalez, L. (2019). Blockchain, herding and trust in peer-to-peer lending. *Managerial Finance*, 46(6), 815-831. doi: 10.1108/mf-09-2018-0423

⁷⁷ Wang, Y., Kim, D., & Jeong, D. (2020). A Survey of the Application of Blockchain in Multiple Fields of Financial Services. *Journal Of Information Processing Systems*, 16(4), 935-958. doi: doi.org/10.3745/JIPS.04.0185

⁷⁸ What are smart contracts on blockchain?. Retrieved 7 April 2022, from <https://www.ibm.com/topics/smart-contracts>

⁷⁹ Bansal, A., & Swamy, S. (2020). Review: Impact of Blockchain Technology in Lending. *International Research Journal Of Engineering And Technology (IRJET)*, 7(4), 2424-2427. Retrieved from https://www.researchgate.net/publication/341151091_Review_Impact_of_Blockchain_Technology_in_Lending

⁸⁰ Schmidt, K., & Sandner, P. (2017). Solving Challenges in Developing Countries with Blockchain Technology. Retrieved from <https://philippsandner.medium.com/solving-challenges-in-developing-countries-with-blockchain-technology-78ec9b01bae3#:~:text=Blockchain%20technology%20can%20solve%20development,restrict%20deception%2C%20corruption%20and%20uncertainties.>

creditworthiness in the first place. By slowly building up their credit history, they are able to receive more and higher-value loans as they repay their smaller loans and apply for larger loans in the future.

Smart contracts and transparent financing

Smart contracts also provide significant benefits in providing financially inclusive and sustainable solutions. As programs stored on a blockchain that run when predetermined conditions are met, smart contracts automate the execution of agreements without any intermediaries. In essence, a distributed ledger is used to store contracts. Blockchain-based smart contracts are characterised by their ability to automate, self-execute, remain immutable and allow distributed access and accurate verification. In fact, the design imperatives of a smart contract lies in its observability of either party's performance of obligations, verifiability to an independent third party that the obligation has been breached or met, privity only to parties of the contract and enforceable through built-in self enforcement protocols through incentives and penalties. As such, they offer a more transparent, efficient and secure way to facilitate contractual processes that are commonplace in capital raising and financing⁸¹.

One alternative financing mechanism that has compelling benefits to the MSME market in developing economies is through crowdfunding. Crowdfunding allows for a quick way to raise funds with fewer regulatory requirements and provides greater cost efficiencies⁸², allowing MSMEs and underserved individual access to finance, whilst paving the way for innovations in microfinance and mobile financial services. Beyond helping the bottom-of-pyramid (BOP) groups and businesses access, crowdfunding has also been successful in connecting funders in developed economies to low-income entrepreneurs in developing countries. For instance, Kiva remains one of the most prominent crowdfunding loan platforms globally and has since coordinated more than 1 million loans from funders to BoP owners in developed economies⁸³.

A lack of transparency remains one of the key concerns of crowdfunders⁸⁴. Trust is integral in the crowdfunding process as both

⁸¹ World Bank Group. (2020). Smart Contract Technology and Financial Inclusion. Retrieved from <http://hdl.handle.net/10986/33723>

⁸² Jenik, I., Lyman, T., & Nava, A. (2017). Crowdfunding and Financial Inclusion. CGAP. Retrieved from <https://www.cgap.org/sites/default/files/Working-Paper-Crowdfunding-and-Financial-Inclusion-Mar-2017.pdf>

⁸³ Kiva's small support team handles 4000+ cases a month, and responds within a day. (2022). Retrieved 11 April 2022, from <https://www.salesforce.com/customer-success-stories/kiva/>

⁸⁴ Mejia, J., Urrea, G., & Pedraza-Martinez, A. (2019). Operational Transparency on Crowdfunding Platforms: Effect on Donations for Emergency Response. *Production And Operations Management*. doi: 10.1111/poms.13014

the crowdfunder and fundraiser need to know that the funds are handled appropriately. On one hand, crowdfunders need to ensure that the funding is transmitted to them when project goals are met. On the other hand, fundraisers need to ensure that their funds are channelled correctly to the project when the fundraising goals are met; or if otherwise, refunded to them. As such, an intermediary in the form of a trustworthy crowdfunding platform is required. This is where smart contracts come into play, as they are suited to alleviate process frictions and operational, fraud and legal risks by holding the funding until a fundraising goal is reached. When the project is fully funded, the smart contract automatically transfers the money to fundraisers. Alternatively, if the project fails to meet fundraising goals, the program executes the refund to the supporters.

Effectively, smart contracts eliminate the dependency on traditional crowdfunding platforms such as Kickstarter, and offers a stronger value proposition to instilling trust between both the fundraiser and crowdfunders. Streamlining and shortening the process, smart contracts provide greater cost efficiencies and operational efficiencies as compared to traditional incumbent platforms. As parameters are already clearly defined in the program, processes are executed automatically. Additionally, a smart contract adds an additional layer of governance and transparency. As it is a distributed ledger, there is no sole ownership of the money until fundraising goals are met. Furthermore, the distributed ledger also enhances verifiability through its auditability⁸⁵. Its immutable characteristic also ensures that once the contract is set, it will be unable to be tampered with, adding an additional layer of security⁸⁶.

In other words, smart contracts provide exceptional benefits that contribute to the overarching objectives of crowdfunding and are key to building trust between stakeholders on either side of the project. Its versatility and interoperability also enables it to be utilised in wider applications than that of capital raising. For instance, smart contracts can also be utilised in insurance and cross border payments^{87,88}, in the push to enable the financially vulnerable to access basic financial services.

⁸⁵ Hamilton, M. (2020). Blockchain distributed ledger technology: An introduction and focus on smart contracts. *Journal Of Corporate Accounting & Finance*, 31(2), 7-12. doi: 10.1002/jcaf.22421

⁸⁶ Miraz, M., & Ali, M. (2020). Blockchain Enabled Smart Contract Based Applications: Deficiencies with the Software Development Life Cycle Models. *Baltica Journal*, 33(1), 101-116. doi: 10.48550/arXiv.2001.10589

⁸⁷ Chen, C., Deng, Y., Tsaur, W., Li, C., Lee, C., & Wu, C. (2021). A Traceable Online Insurance Claims System Based on Blockchain and Smart Contract Technology. *Sustainability*, 13(16), 9386. doi: 10.3390/su13169386

⁸⁸ Khan, S., Loukil, F., Ghedira-Guegan, C., Benkhelifa, E., & Bani-Hani, A. (2021). Blockchain smart contracts: Applications, challenges, and future trends. *Peer-To-Peer Networking And Applications*, 14(5), 2901-2925. doi: 10.1007/s12083-021-01127-0

Cryptocurrency

While blockchain technology has unparalleled potential in allowing the financially vulnerable to spend and exchange money in a cheaper and faster way, one of its most prominent applications is the cryptocurrency. Using blockchain technology, cryptocurrency is a medium of exchange, created and stored electronically in the former through encryption techniques to algorithmically control the creation of monetary units and verify the transfer of funds⁸⁹. As at 2021, cryptocurrencies were valued at over \$2 trillion in market capitalisation⁹⁰ – and this number is further expected to increase as cryptocurrency-based lending applications and decentralised trading revenues gain more traction. One of the best known examples is Bitcoin.

A transformation in cross-border remittances

The borderless nature of cryptocurrencies has allowed it to be proposed as an alternative medium for international remittances⁹¹. Globally, remittances cost an average of 6.30 percent of the amount sent⁹². For many salaried workers in developing economies such as Kenya, this can comprise a significant amount of their monthly income – sometimes up to 30% of their gross earnings⁹³. For some financially vulnerable groups such as low-wage migrant workers, the hefty fees incurred in cross-border remittances is an even more pressing issue for them to send money back home. International transfers by traditional intermediaries such as Western Union and MoneyGram often impose high costs for their services^{94,95}. This results in many migrant workers

-
- ⁸⁹ Making sense of bitcoin, cryptocurrency and blockchain. Retrieved 11 April 2022, from <https://www.pwc.com/us/en/industries/financial-services/fintech/bitcoin-blockchain-cryptocurrency.html>
- ⁹⁰ Global Future Council on Cryptocurrencies. (2021). Cryptocurrencies: A Guide to Getting Started. World Economic Forum. Retrieved from https://www3.weforum.org/docs/WEF_Getting_Started_Cryptocurrency_2021.pdf
- ⁹¹ Soufaih, A. (2021). Revolutionizing International Remittance Payments Using Cryptocurrency and Blockchain-based Technology. Social Impact Research Experience (SIRE), (75). Retrieved from <https://repository.upenn.edu/sire/75>
- ⁹² The World Bank. (2021). Remittance Prices Worldwide Quarterly. Retrieved from <http://remittanceprices.worldbank.org/>
- ⁹³ Mercy Corps Ventures. The potential of cryptocurrency for Kenya's youth: Pilot insights on stablecoin micropayments for digital workers. Retrieved from https://www.mercycorps.org/sites/default/files/2022-02/MCV-Pilot-Insights-Report_Stablecoin-and-Digital-Microwork-in-Kenya-Web.pdf
- ⁹⁴ Bersch, J., Ruiz, E., Yakhshilikov, Y., Clevy, J., & Muhammad, N. (2021). Fintech Potential for Remittance Transfers: A Central America Perspective.
- ⁹⁵ Campioni-Noack, I. (2021). Cryptocurrencies: an innovative solution to migrant remittances?. Retrieved 11 April 2022, from <https://blogs.lse.ac.uk/humanrights/2021/04/29/cryptocurrencies-an-innovative-solution-to-migrant-remittances/>

having no choice but to limit the frequencies of their remittances, even when emergency expenditures may be required by their families.

Similar to other blockchain technologies, transaction time and costs can be significantly reduced by the elimination of the middleman. Conventionally, a foreign exchange transaction requires the completion of tedious paperwork and payment of the significant bid-ask spread between the two currencies. Thereafter, the transaction goes through a series of third-party middlemen such as an intermediary and an end-point bank in the receiving country⁹⁶. The SWIFT protocol currently acts as a network to bridge two banks without an established financial relationship by searching the network for correspondent intermediary banks that can settle the transaction and take a cut of the fee. Another cut of the fee is then absorbed by the actual intermediaries that process the funds – the SWIFT protocol only sends the payment orders⁹⁷. The substantial involvement of intermediaries results in a series of commissions being charged, with zero transparency and a lack of immutable records for verifiability.

To counter this, cryptocurrency acts as an asset to remit money with little costs to transfer and allows for currency exchange with no markup. In fact, with cryptocurrency as a medium, transfer fees could be reduced to as little as 0.025%⁹⁸. On the whole, a study by Accenture expects that blockchain technology could bring down the global clearance and settlement costs by \$10 billion annually. With an almost instantaneous processing, cryptocurrencies also help to alleviate the issue of an uncertain payment time encountered with traditional intermediaries – allowing users to transfer money swiftly during exigencies. On a macroeconomic level, the cryptocurrency-based blockchain technologies will also allow overall payment processing capacities to expand globally.

While traditional cryptocurrencies such as Bitcoin are already able to provide significant advantages, the payment landscape is also seeing new entrants in the form of cryptocurrency-based blockchain payment systems. To take an example, Ripple is a blockchain technology that bypasses the intermediate tiers of the banks to enable transactions to be confirmed in seconds⁹⁹. The medium used is in the form of a cryptocurrency, XRP, in which its sole objective is to be converted back

⁹⁶ Low, R., & Marsh, T. (2019). Cryptocurrency and Blockchains: Retail to Institutional. *The Journal Of Investing*, 29(1), 18-30. doi:10.3905/joi.2019.1.102

⁹⁷ How Blockchain Could Disrupt Banking. (2021). Retrieved 11 April 2022, from <https://www.cbinsights.com/research/blockchain-disrupting-banking/>

⁹⁸ Reeves, M. (2017). Cryptocurrency-Remittance Transfers Futuristic Technologies & Poverty Alleviation. *Economics Student Theses And Capstone Projects*, (56). Retrieved from https://creativematter.skidmore.edu/econ_studt_schol/56

⁹⁹ Qiu, T., Zhang, R., & Gao, Y. (2019). Ripple vs. SWIFT: Transforming Cross Border Remittance Using Blockchain Technology. *Procedia Computer Science*, 147, 428-434. doi: 10.1016/j.procs.2019.01.260

and forth between currencies¹⁰⁰. In its design we see its ingenuity – by having both a distributed ledger and cryptocurrency, the transaction data and the actual funds are carried synchronously in real time. This is enabled through the use of its decentralised P2P network that allows for both the bidirectional messaging between the messengers of both the sending and receiving bank, inter-ledger protocols (ILPs) to track debits, credits and liquidity of the transaction, FX ticker, and validator for real-time settlement¹⁰¹. As a result, it only takes around four or five seconds to complete transactions¹⁰².

Safeguarding against financial collapse

In economies where financial systems have collapsed, cryptocurrencies are a good way for people to safeguard their assets and perform remittances. Venezuela serves as a perfect example of how cryptocurrency has transformed the lives of people who are unable to access basic financial services due to the state of their economy. Wrecked by hyperinflation of the national currency, Bolivar, most Venezuelans do not have sufficient US dollars to be able to open a US bank account and thus are barred from accessing international banking services¹⁰³. At the same time, sanctions and compliance regulations resulted in the closure of multiple international bank accounts, restricting their access to the international financial market. The persistent distrust of the traditional banking sector and the sentiment of cryptocurrencies as a hedge to volatile currencies and geopolitical risk has also led a strong push toward cryptocurrencies¹⁰⁴.

This is where cryptocurrency can step in – it provides a viable solution for populations living in countries with fluctuating and unstable monetary systems as a storage of value or platform for holding their

¹⁰⁰Reed-Woodard, M. (2018). Cross Border Payments. *Network Journal*, 25(2), 45.

¹⁰¹Chen, P. (2018). Ripple, the disruptor to the forty years old cross-border payment system - Digital Innovation and Transformation. Retrieved 11 April 2022, from <https://digital.hbs.edu/platform-digit/submission/ripple-the-disruptor-to-the-forty-years-old-cross-border-payment-system/>

¹⁰²Kaygin, E., Zengin, Y., Topcuoglu, E., & Ozkes, S. (2021). The Evaluation of Block Chain Technology within the Scope of Ripple and Banking Activities. *Journal Of Central Banking Theory And Practice*, 10(3), 153-167. doi: 10.2478/jcbtp-2021-0029

¹⁰³Rendon, M. (2021). How Open and Public Cryptocurrencies Can Help Venezuelans. Retrieved 11 April 2022, from <https://www.csis.org/analysis/how-open-and-public-cryptocurrencies-can-help-venezuelans>

¹⁰⁴Clements, R. (2018). Assessing the Evolution of Cryptocurrency: Demand Factors, Latent Value, and Regulatory Developments. *Michigan Business & Entrepreneurial Law Review*, (8.1), 73. doi: 10.36639/mbelr.8.1.assessing

wealth¹⁰⁵. In fact, Bitcoin has emerged as a more attractive alternative to holding the rapidly depreciating national currencies in Argentina and Venezuela that even the relatively high price volatility of the former imposes less of a barrier¹⁰⁶.

The nature of cryptocurrency allows it to be a good alternative storage of value and hedge in troubled economies. For instance, despite the fact that new Bitcoins can enter the exchange through mining, there is ultimately a finite number that are allowed to exist. Its algorithmically fixed production schedule helps protect the coins from arbitrary inflation by the central authority through Proof-of-Work¹⁰⁷. Furthermore, cryptocurrencies like bitcoin are decentralised, shielding it against pitfalls associated with monetary supply, such as macroeconomic supply shocks and asset market inflation¹⁰⁸.

Where inflationary pressures have a direct correlation to currency devaluation¹⁰⁹, cryptocurrencies such as Bitcoin also address problems relating to wildly fluctuating exchange rates. Cryptocurrencies also have the ability to insulate against currency wars initiated due to escalating geopolitical tensions. This was observed when Brazil declared a currency war on the United States due to the latter's expansionary monetary policy which had resulted in the Brazilian Real to appreciate¹¹⁰. As the Brazilian government introduced a series of measures that had the intention to depreciate the currency in a controlled manner, it had, in reality, resulted in the severe fluctuation of exchange rates. Faced with the volatility of exchange rates, Brazilians turned to Bitcoin as a store of value and a medium of exchange into other more stable currencies.

While the benefits of cryptocurrencies can be realised by anyone who accesses the financial system, its benefits are felt the most among the financially vulnerable in developing economies with a volatile and unstable monetary system.

¹⁰⁵Southurst, J. (2014). ZipZap CEO: Argentina's Volatility Makes Bitcoin Look Stable. Retrieved 11 April 2022, from <https://www.coindesk.com/markets/2014/04/01/zipzap-ceo-argentinas-volatility-makes-bitcoin-look-stable/>

¹⁰⁶Folkinshteyn, D., & Lennon, M. (2016). Braving Bitcoin: A technology acceptance model (TAM) analysis. *Journal Of Information Technology Case And Application Research*, 18(4), 220-249. doi: 10.1080/15228053.2016.1275242

¹⁰⁷Ghimire, S. (2022). Analysis of Bitcoin Cryptocurrency and Its Mining Techniques. Retrieved 11 April 2022, from <http://dx.doi.org/10.34917/15778438>

¹⁰⁸Darlington, J. (2014). The Future of Bitcoin: Mapping the Global Adoption of World's Largest Cryptocurrency Through Benefit Analysis. Chancellor's Honors Program Project. Retrieved from https://trace.tennessee.edu/utk_chanhonoproj/1770

¹⁰⁹Cooper, R. (1971). *Currency devaluation in developing countries* (1st ed.). Princeton University. International Finance Section.

¹¹⁰Mackenzie, K. (2012). Brazil declares new 'currency war'. Retrieved 11 April 2022, from <https://www.ft.com/content/76d1d4d0-63d0-11e1-8762-00144feabdc0>

Conclusion

AI, Blockchain and Cryptocurrency present promising new opportunities to revolutionise how things are traditionally done in the existing global financial system. As financial inclusion remains a key social and economic agenda in countries all over the world, fintech companies are likely to take the centre stage in harnessing digital technologies and applications through the former to address institutional inefficiencies and alter public expectations in the process.

At the same time, these technologies will face an enormous hurdle in scaling up and achieving widespread adoption and acceptance; enabling inclusive financial services to the masses. Market entrants offering innovative AI, Blockchain and Cryptocurrency based products will need to navigate through regulatory uncertainty across different geographical and political landscapes. The regulatory direction taken by governments are likely to differ and lead to substantial uncertainty in the short and medium term. While regulatory bodies have since improved in working with the industry to build an ecosystem that balances protection and regulation, regulatory uncertainty will undoubtedly surface as regulators struggle to meet with the rapid advancement and evolution of AI, Blockchain and Cryptocurrency technologies. With overarching regulatory uncertainty, investors become hesitant and innovation may be dampened¹¹¹.

As posited at the World Economic Forum, technologies alone are insufficient to spearhead the creation of new market infrastructure or lead to the improvement of existing infrastructure¹¹². The involvement of all players in the entire ecosystem is necessary to shape the direction of financially inclusive technologies. Strategic partnerships, established with sound frameworks and implementable timelines, can help stakeholders respond and adapt to a rapidly evolving financial services landscape globally. After all, universal financial inclusion can only be achieved when innovation is aligned with shared strategic objectives in the entire ecosystem.

Fintech has the power to uplift the lives of the 1.7 billion people who are outside of the traditional financial system¹¹³. With the advancement of AI, Blockchain and Cryptocurrency technologies, there has never been a

¹¹¹MagnaCarta. (2019). Removing Roadblocks: The New Road of Fintech. MagnaCarta & Klarna. Retrieved from <http://www.fintechmundi.com/wp-content/uploads/2019/01/EMEA-Fintech-Disruptors-Report-2019.pdf>

¹¹²World Economic Forum & Deloitte. (2017). Beyond Fintech: A Pragmatic Assessment Of Disruptive Potential In Financial Services. Retrieved from <https://www.weforum.org/reports/beyond-fintech-a-pragmatic-assessment-of-disruptive-potential-in-financial-services>

¹¹³Demirguc-Kunt, A., & Klapper, L. (2012). Measuring Financial Inclusion: The Global Findex Database. Policy Research Working Papers, 39. doi: 10.1596/1813-9450-6025

better time to call upon all stakeholders across the value chain - investors, businesses, consumers and regulators alike - to take part in the development of the fintech ecosystem. Fintech is a force for good - and it is here to stay.

This page intentionally left blank.