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Mobile Money & Payments: Technology Trends

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- Blockchain & Financial Services: 5th Horizon of Networked Innovation
- Blockchain & Transactions, Markets & Marketplaces
- Blockchain & Infrastructure (Identity, Data Security)
- Blockchain & Policy: pending review
- Mobile Money & Payments
- Prediction Markets
- Artificial Intelligence & Financial Services: From Robo-advising to Algorithmic Trading
- Digital Banking

Money

Money is a medium dating back at least to Asia Minor in the 7th Century B.C.E. in the form of single-sided electrum coins issued by the Lydian Empire[1], and possibly earlier to clay tokens used by the Sumerian Empire in 8,000 B.C.E.[2]. If we expand the definition to include barter, we can date money back to 12,000 B.C.E. when obsidian and cattle served as media of exchange. Whether a social phenomenon that emerges and is subsequently regulated by governments (as the bitcoin ideologists would argue), or a means of control imposed from above by the State (as Prof. Christine Desan of Harvard Law argues[3]), today, money is undergoing a dramatic series of changes impelled by the adoption of an array of digital technologies. These changes in turn are driving an active dialog about the role of government in money, the opportunities for citizens to govern their own financial means of exchange, and the place technology holds in opening the Pandora's Box of monetary technology.

The growing ubiquity of mobile phones, in a number of emerging economies, is driving financial infrastructure to leapfrog developed nations, and is delivering a dynamic and changing sea of financial innovations. In China, Alibaba and WeChat are vying for primacy as the bank of the future. In the U.S., startups like Square and Looppay have provided new means of access for small merchants and individuals, increasing the potential for economic throughput in the small businesses that comprise a critical engine of economic growth.

We will explore, in this paper, the terrain of mobile money and payments technology, the dynamics of the current system, and potential future areas for innovation.

I. Definitions of Money

In a global world, why does geography matter so much for money?

Looking at recent developments in money, questions often arise about the difference between electronic money (e-money), mobile money, and a number of other terms used freely in this evolving space. While there may not be a universally agreed terminology, there has been general alignment among international organizations including the World Bank, GSMA and European Union, allowing us to start defining the terminology around digital money in a broadly accepted manner. For the purposes of this paper we will use the below definitions.

DIGITAL MONEY

We will use "digital money" as a catchall term to encompass e-money as well as mobile money. Technically, almost all money today is by definition "digital money", since once a deposit is made at a bank the "money" is converted into 1s and 0s. For our purposes, we will use digital money as an umbrella term for the new wave of innovative money access, transfer and management technologies.

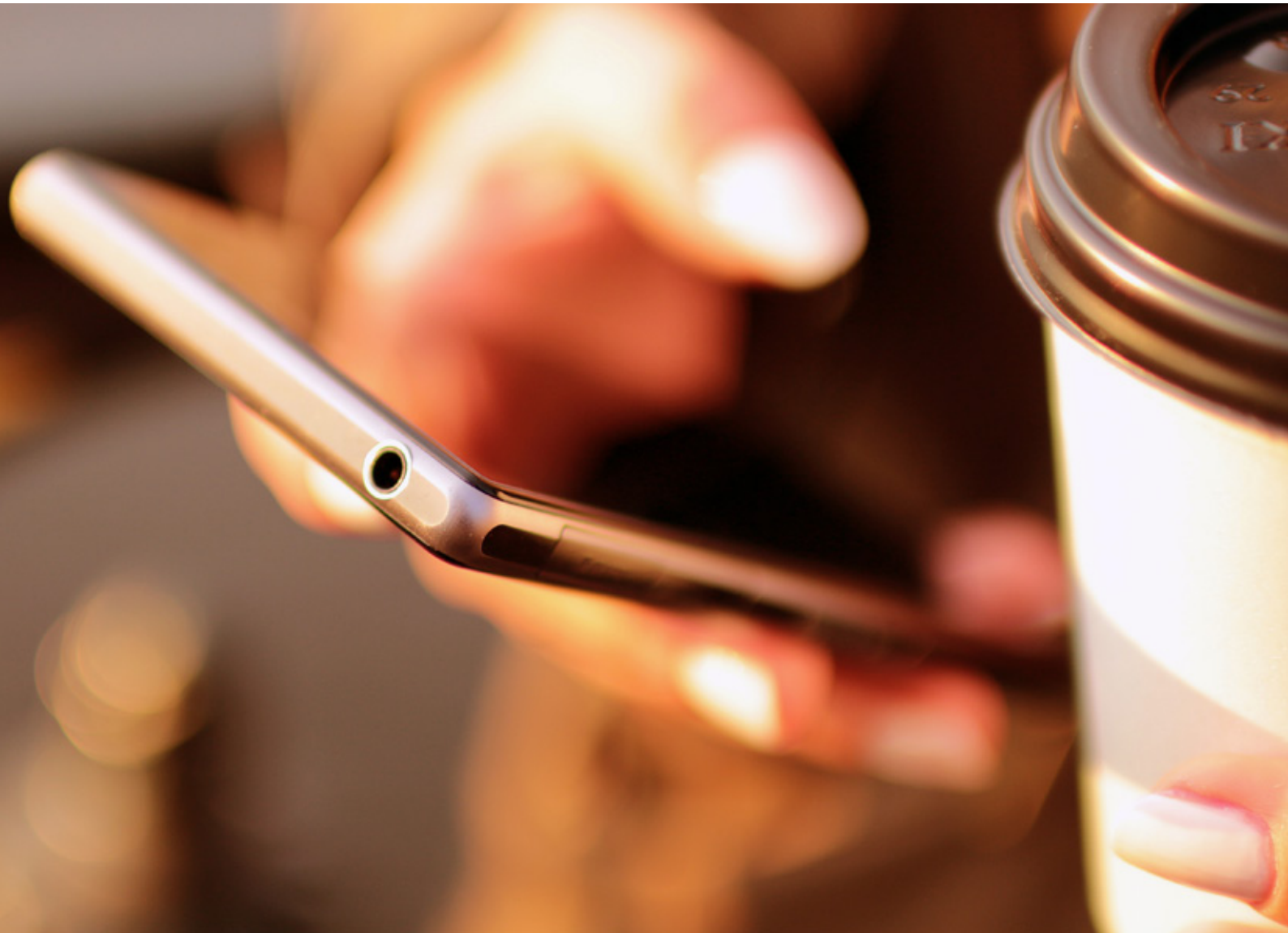
E-MONEY

Short for electronic money, the EU defines e-money as a monetary value represented by a claim on the issuer which is stored electronically and issued on receipt of funds, for the purpose of making payment transactions, and is accepted by natural or legal persons other than the issuer.[4] Under this definition e-money refers to any type of electronic stored value that serves as an alternative to cash. This could cover anything from gift cards to Bitcoin to values stored through Venmo. Traditionally e-money differs from money in a bank account in two significant ways. First, it is often not covered under financial protections such as the USA's FDIC insurance. Second it often does not earn interest.

MOBILE MONEY

Mobile money refers to a broad spectrum of financial services which can be accessed through a mobile phone.[5] To date airtime purchases, bill payments and remittances are the leading uses of most mobile money services.[6] Mobile Banking, in contrast, specifically refers to the financial services associated with a bank account such as deposits, withdrawals or bill payments.

While mobile money can include access to e-money, surprisingly most mobile money services are still largely cash-based with service providers acting as intermediary cash agents. This partially explains why evolutions in mobile money are expected to contribute to financial inclusion. Of the 2.5 billion people as of 2012 that did not have a financial account, 1.7 billion had a mobile phone.[7] As of 2012 there were more mobile money accounts than traditional bank accounts in Kenya, Madagascar, Tanzania and Uganda.[8]



II. Evolution of Money Technology

When asked to picture money today, many people conjure up images of paper, metal, and plastic, yet with the rise of e-money and mobile banking this may soon be replaced with thoughts of a mobile app. While still in the early stages of service offerings, the rapidly growing societal acceptance of mobile money paves the way for new business models as well as raising fundamental questions about money and its relationship to technology, geography and financial access.

In some ways the newest developments in money represent a digital throwback to the early days of money with concepts like digital bartering, and currency that is based on an unregulated, individually agreed-upon value. Before laying out the potential impact mobile money could have, we will first develop a shared understanding of the definition of money and the evolution of money technology:

Money is any clearly identifiable object of value that is generally accepted as payment for goods, services and repayment of debts within a market or which functions in a manner similar to the legal tender of a country.

The earliest notions of money were associated with the barter systems that have existed almost as long as humanity itself. Aristotle in 350BC contemplated, "Of everything which we possess there are two uses: both belong to the thing as such, but not in the same manner, for one is the proper, and the other the improper or secondary use of it. For example, a shoe is used for wear, and is used for exchange."[9] Barter systems had some key fundamental flaws, first it was subject to the coincidence of want's problem or the issue that trade was limited by the need for two parties with different goods that each wanted of the other's. Second all the parts of the transaction from sale, exchange and purchase were collapsed into one step.

Issues with bartering led to the first major evolution in money technology as a means of exchange and a store of value. This was a major step forward in convenience as money was now a unit of account.[10] An early coin currency was created in Lydia (now modern day Turkey) by King Alyattes in about 600 BCE. A century later China created the first paper currency, yet paper money did not gain significant popularity until 1661 AD in Sweden. These developments in money technology enabled many of the financial institutions we know today, ranging from banks to letters of credit, and increasing the fungibility and utility of money. Money remained relatively static until 1946 with the invention of the first modern credit card. The 1960s and 1970s brought computerization to retail banking with the advent of the ATM, promoted by John Reed at Citibank. The 1990s saw experimentation with a variety of digital currency technologies such as Flooz. 1999 saw the first mobile banking transactions through SMS

by European Banks.[11] Interestingly enough, while mobile contactless payments are considered a very recent development, the origins of this type of payment was in 1997 with the "speedpass" payment system available at Mobil gas stations using RFID technology.[12]

In 2008, Satoshi Nakamoto introduced the world to Bitcoin, the first broadly-adopted, fully digital, decentralized cryptocurrency technology.[13] Sovereigns such as the China,[14] U.K.,[15] Japan,[16] even the Vatican[17] are exploring electronic versions of their own cryptocurrency and legitimizing digital currencies by incorporating into their existing regulatory schema, while offshore havens like Barbados[18] are both issuing fiat digital currency and avidly pursuing digital currency startups.

There are some important attributes for a store of value to be considered a valid currency. First, it is a medium of exchange agreed by a community of buyers and sellers. Second, it is in a form that is relatively efficient and convenient to exchange in the way that, for example, paper money is more favored than a gold brick. Lastly, it needs to be viewed as reliable. While short-run economic issues may occur, for a currency to have long-term staying power people must believe it will remain a store of value in the future.

Efficiency in exchange is deeply affected by money technology. Changes in efficiency both help drive the adoption of new money technologies as well as change people's spending behaviors.

One example is reflected in contactless payments. MasterCard published a study looking at 15 months' worth of spending habits based on enrollment in their PayPass program. The research showed that within the 12 months following their first contactless transaction, those accounts spent almost 30% more on average, using their PayPass-enabled card. This was true across the board when controlling for low, medium and high spending habits prior to enrollment. There was also a significant increase to top-of-wallet behaviors such as Recurring Payments, e-Commerce and Cross Border spend, with Cross Border spend exceeding a 50% increase in all three account types. According to Jonathan Orndorff, Principal at MasterCard Advisors and study lead, "In our highest spend segment, this lift translates into approximately $600 per month in incremental spend.[...] Lifts in not just overall spend but the quality of spend also helps the business case for contactless."[19]

Increasing efficiency encourages an increase in overall spending which is a strong motivator for financial and technology companies pursuing this goal. However, it raises interesting questions about an ideal level of ease of currency. Without a physical representation of money, will this lead to a loss of understanding of "value"? If spending is too easy, will this lead to a rise in negative financial behaviors such as overspending and impulse buying hurting long-term financial wellbeing?

Geography has also traditionally played a key role in currency, though often as a barrier for financial inclusion. Proximity was formerly a limiting factor to getting a sufficiently large market of buyers and sellers. For the third attribute of reliability to be ensured, government borders and national interests also became entangled with geography and with currency. This relationship has proven complex as geography and lack of proximity to financial institutions is one of the biggest impediments to increasing financial access.

Even as the world becomes increasingly interconnected, those without technological access, due to a physically remote location without sufficient infrastructure, or those who are prevented from obtaining access, become even more isolated from traditional banking systems, and more vulnerable to predatory practices. Mobile money through telecom networks can help bridge this last gap, so that technologies such as mobile money can be a key driver of economic growth and poverty alleviation. Better financial access can boost job creation, reduce economic vulnerability to shocks and increase investments in human capital. Far from a zero-sum game, financial inclusion has enormous impact potential from both a societal and revenue perspective. Within this paper we will look at some ways groups are capitalizing on opportunities with mobile money and tapping into new customers, products and markets.

III. The Mobile Money Ecosystem

"The three rules of retail are location, location, location. In mobile money, they're partnership, partnership, partnership. We need to create a mesh of partnerships covering various networks of relationships."[20] As Napoleon Nazareno, President of Smart Communications highlights, a high degree of network interconnectivity is critical to the mobile money ecosystem. To that end, it is evolving at a global scale with many players, large and small as well as traditional and new entrants. While networks are a critical component to the landscape, traditional industry lines are increasingly blurring, particularly between mobile service providers and finance, bringing opportunities for new business models but also bringing competitive threats from unexpected industries. Some of the key roles from an end to end perspective include, though are not limited to:

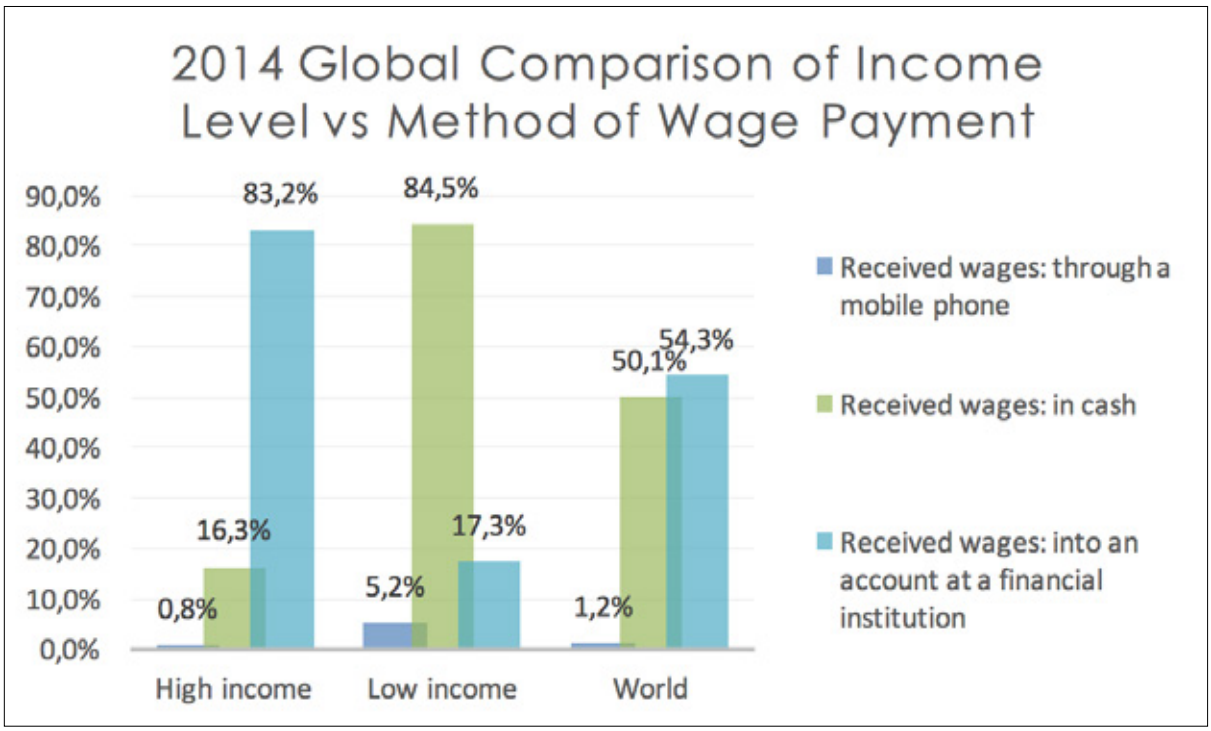
PARTICIPANT	ROLE
Mobile Network Operators (MNO) / Communication Service Providers	Provides the communication service and infrastructure. In some regions (where legally authorized) they are entering the financial arena by issuing e-money, offering payment services. Additionally some are working in an advisory capacity on mobile strategy for industries new to the mobile space.
Banks and Fintech companies	Create and offer banking services that are available for mobile offerings. The Fintech startups have been able to move faster than traditional banks but both are instrumental in providing financial expertise as well as push forward new banking offerings
Agents / Intermediaries	Often the consumer-facing touchpoint, usually having a physical presence. They primarily perform cash-in/out functions as well as account openings and other transactions. In developing economies they play a key role and can often be seen as the "face" for a mobile money offering.
Retailers / Employers	Payments could be for B2C transactions, this can be broad for any from apurchase at a store or bill pay for utilities to payment of wages, as well as B2B transactions.
Regulators	Seek to provide a regulatory framework that will protect individuals as well as offer stability to the financial system while at the same time providing an innovation-friendly environment. As the term mobile money suggests, telecommunications as well as financial regulators will need to collaborate.

When these players collaborate, the results can drive significant change. The M-Pesa, an e-money and mobile product offering of the Kenyan Pesa, has driven meaningful adoption. As of 2013, 93% of the adult population in Kenya is registered for M-Pesa and 60% actively use the service. The impact of the M-Pesa is much broader as it has facilitated the creation of thousands of small businesses and gave nearly 20 million Kenyans access to financial services, particularly low-income Kenyans. The percentage of people living on less than $1.25 a day using M-Pesa grew from less than 20% in 2008 to 72% in three years.[21]

M-Pesa's origins were in research. The UK's Department for International Development (DFID), noticed that Kenyans were bartering mobile airtime as an alternative to cash. DFID saw the unserved need and connected with communications service provider Vodafone, who was looking for opportunities to support microfinance through its mobile platform. Vodafone and DFID each made matching investments of £1 million. MNOs have been able to become fast movers in the mobile money space through their greater levels of investment and their existing networks and distribution channels. According to the Global Mobile Systems Association, in 2014 there were 255 mobile money services across 89 countries, including 60% in developing markets.

The M-Pesa also highlights some tension between these players, specifically MNOs and finance companies. While MNOs have taken a step into finance, finance companies are starting to return the favor. Safaricom has enjoyed an almost monopoly as the sole authorized mobile money services provider. In 2014 three more MNOs were authorized, including Kenya's most profitable bank Equity Group, all of which use Safaricom's largest competitor Airtel's mobile network. Equity Group started offering free SIM cards to drive adoption and acquired more than 650,000 customers by mid-2015. Bitcoin-based competitors like Bitpesa are gaining market share. While M-Pesa still holds 20 million out of the 26 million mobile consumers in Kenya, the competition is starting which will serve both the private and public good.[22]

As discussed earlier, the majority of mobile transactions still involve some component of cash. This puts a spotlight on two of the players, employers and agents. There is a clear use case for retailers to accept mobile payments but employers offering mobile payment of wages is still less understood and still a nascent area. According to the World Bank just over 1% of all employees received money through phones. One notable regional exception is the developing nations of Sub-Saharan Africa, where 7.8% of employees receive wages through phones.[23] Why this is significant becomes apparent when you look at the striking difference in cash versus direct transfers into a financial account between low income and high income groups. A comparison chart is included below. Cash wages present risks not just to employees but also employers. Moving to a mobile system reduces the need to keep cash on hand or make bank trips, both of which have a higher theft risk as well as a more efficient and trackable way to manage payroll. Retailers who can already benefit from adoption of mobile payments can continue to leverage these services further to the benefit of their employees.



Source: World Bank Group. Global Findex Database.2014.

Agents' role in the ecosystem should not be understated, particularly in developing countries. Agents are contracted by mobile money service providers to facilitate transactions for users. A 2012 McKinsey study of mobile money providers in emerging markets looking at why many solutions failed to gain sustainable scale and identified that execution was the problem. More specifically, poor agent networks was the largest factor, with a need for compelling product offerings and maintained corporate commitment as other key factors.[24] Often it is believed that agents' most important function is cashing-in and out for clients. Liquidity, both in terms of physical cash and e-float, are often limiting factors for clients. Similarly, liquidity is a challenge for agents and so a super-agent, or larger intermediary agent, is required. While liquidity is a current barrier, these are surmountable logistics issues.

Arguably the agents' other role as an extension of their primary retail business is far more important. They are in essence front-line customer service, as a result they are make-or-break for company trust and customer education, both of which directly impact activity rates. Yet agents are often not trained or incentivized for such a role. The Gates Foundation estimates that agents must process around 30 to 50 transactions per day for their business to be viable because most are paid on commission. It could take upwards of a year for an agent to make a profit so typically agents also have other kinds of business in addition to mobile money. This means the person teaching new mobile money clients how to use the mobile services is at best part-time and at worst misleading clients while pushing other sales. Different countries have different regulations for agents, highlighting another difficult aspect of mobile money regulation. With a global ecosystem comes a global array of regulators.

"When regulators embrace a leadership role in developing the market, they become innovative and take reasonable risks inherent to making the changes needed to create a more inclusive financial sector. Although regulators' main concern is always the safety and soundness of financial systems, those that have made the most progress have been willing to explore new routes or to use new tools to enhance traditional financial activities."[25]

As expressed by Professor Prof. Njuguna Ndung'u, governor of the Central Bank of Kenya, the responsibilities for regulators fall under two umbrella concepts, protection and innovation facilitation. While the need to protect is always important, regulators have an opportunity to make a huge difference to financial inclusion and economic prosperity not just with mobile money but with development of the broader range of new financial technologies. Innovation facilitation in this area involves a focus on interoperability and becoming leaders in global collaboration.

Regulators will need to grapple with new issues such as having a stance on e-money and dealing with financial or adjacent products created by non-banks. Areas that used to have clear functions, like a bank and a telecommunications provider, had clear and expert governing regulatory bodies. Regulation will need to span not just across industry but now across borders. Cross border payments and products are increasingly highlighting the need for more coordinated regulation both for technology standards and policy. This collaboration requires careful balancing with national interests.

There has been promising headway. In 2013 the Financial Action Task Force (FATF), the inter-governmental group developing policies to fight money laundering and terrorist financing, issued its first-ever guidance document for prepaid cards, mobile payments and internet based payment services. It takes a risk-based approach and covers almost all big mobile money markets, from Kenya to Pakistan, where these types of risks are highest. The FATF left significant leeway for national regulators to regulate mobile money services in a way they saw best fit to promote financial inclusion and innovation.

With a cohesive regulatory environment, the range of transaction and services for which mobile money can be used will eventually be as broad as financial services that exist today. A prime example of this are credit score ratings. The traditional credit score is based, in part, on having credit already – an inherent obstacle to financial access (if you don't have credit, you can't get credit). Our group at MIT wanted to see if using mobility data (how people move around and where they shop) could better predict the likelihood of someone experiencing financial difficulties in the future, such as overdrawing on an account or missing a payment. Analyzing hundreds of thousands of transactions using financial and location (mobile geography information) the team created a predictive model based on animal foraging and behavior patterns resulting in models that were 30-49% better at predicting financial distress than traditional demographic models.[26] Understanding client's behaviors in a deeper way means that a bank could work with the client before financial hardship and help them make better financial decisions.

IV. Mobile Trading

Through mobile trading, investors are able to access trading platforms from smartphones as opposed to only on their computers or through direct communication with brokers. Mobile trading is a natural extension that follows on from online trading, as mobile becomes the dominant channel for internet access. According to Ofcom Technology in 2015, 33% of internet connections occurred through smartphones, followed by laptops at 30%, tablets at 19% and desktops at 14%.[27]

In 1982, the first full service electronic consumer equity trading system called NAICO-NET, offered by North American Holding Corp., for buying and selling stocks, mutual funds and commodities on a computer came online.[28] TradePlus was founded by William Porter and Bernard Newcomb around the same time, and offered a retail trading platform in 1985. The same founders subsequently founded E-trade in 1991, which offered trading services via America Online and Compuserve. E-trade has offered mobile trading platforms since 2010 and has a market capitalization of nearly $7 billion US dollars today.

The 1990s saw other retail brokers, such as Charles Schwab and TD Ameritrade, launch in the online market.[29] Today, although the traditional players such as Charles Schwab, TD Ameritrade, Fidelity and Merrill Edge remain dominant players in the mobile trading industry, recent start-ups have introduced further innovations. We see four key trends across the online retail trading industry: namely the proliferation of (i) mobile apps, (ii) greater access through lower fees and barriers to entry, (iii) social functionality and crowdsourced information sources, (iv) greater sophistication in functionalities. Some examples include:

(i) **Mobile apps:** All of the four traditional players mentioned above offer mobile apps. Offering mobile functionality is becoming the industry norm for retail online brokerage firms. A recent study conducted by ORC International for Fidelity revealed that 56% of mobile users access financial apps for sophisticated investing tasks such as analysis, reports, and trading.[30] Mobile trades comprised 5.5% of all retail trades placed in December 2013, but exceeded 7% in December 2014, showing a gain of 43.7%.[31]

(ii) **Greater access through lower fees and barriers to entry:** Robinhood, for example, offers commission-free trading on U.S.-listed stocks and exchange-traded funds (ETFs), as opposed to $6.99 to $9.99 per trade for the traditional players.

(iii) **Social functionality and crowd-sourced information:** Estimize[32] and Vetr[33] are examples of companies which provide crowd-sourced ratings and data for the stock market.

(iv) **Increased sophistication in functionality:** Motif Investing helps facilitate the building of thematic portfolios.[34]

The three largest online brokers, Charles Schwab[35], E*TRADE[36] and TD Ameritrade[37] collectively control over $3.6 trillion in assets across 20 million accounts as of April 2016. However, the industry is undergoing fragmentation, with margins being squeezed further by no-commission online brokers, such as Robinhood and Loyal3.

Robinhood, which has raised over $66 million of venture funding, plans to make money off margin accounts (accounts where investors borrow money to buy securities), currently testing in beta mode, and interest accrual from customers' uninvested cash balances.[38]

Motif Investing, backed by $126.5 million, allows investing at commission of $9.95 per motif and $4.95 per single stock. Fidelity, Charles Schwab, and Ameritrade charge commission of between $7.95-$9.95 per trade.[39]

Feex is a startup that exposes "hidden fees" in financial services (particularly asset management), and is seeking to recover a claimed $600 billion annually from incumbent financial services providers.[40] Decision analytics tools like these will become increasingly important as consumers become more sophisticated.

As we explore beyond trading platforms into advisory tech, Personal Capital, Wealthfront and Betterment have created great unease within the traditional wealth and asset management firms with their Millennial-friendly approach. In the summer of 2015, BlackRock purchased FutureAdvisor to stay competitive in this dynamically evolving landscape.[41]

We will explore Robo-advising in more detail in our forthcoming paper "Artificial Intelligence & Financial Services".

V. Money Transfers

Online peer-to-peer money transfers allow consumers to quickly and easily send money to each other, without having to deal with the cumbersome process of writing and mailing a check or transferring physical cash. Online money transfers are not characterized by the location where the consumer authorizes the transfer; paying rent to a US-based roommate on an app works exactly the same way whether one is in the next room or thousands of miles away – as long as there is an internet connection and perhaps international mobile roaming for authorization purposes. We will first explore peer-to-peer money transfers in general, and then move on to international remittances in particular in the next section.

PayPal is often associated with the ushering of the new online peer-to-peer payments era in the 2000s. Now, many traditional banks offer a way to do this easily online. Bank of America, for example, allows its customers to send money to friends using just a phone number or email address of the receiving party.[42] Outside of traditional banks, platforms from fintech and consumer tech players offer peer-to-peer payment options that are often well integrated into messaging or other social functionalities.

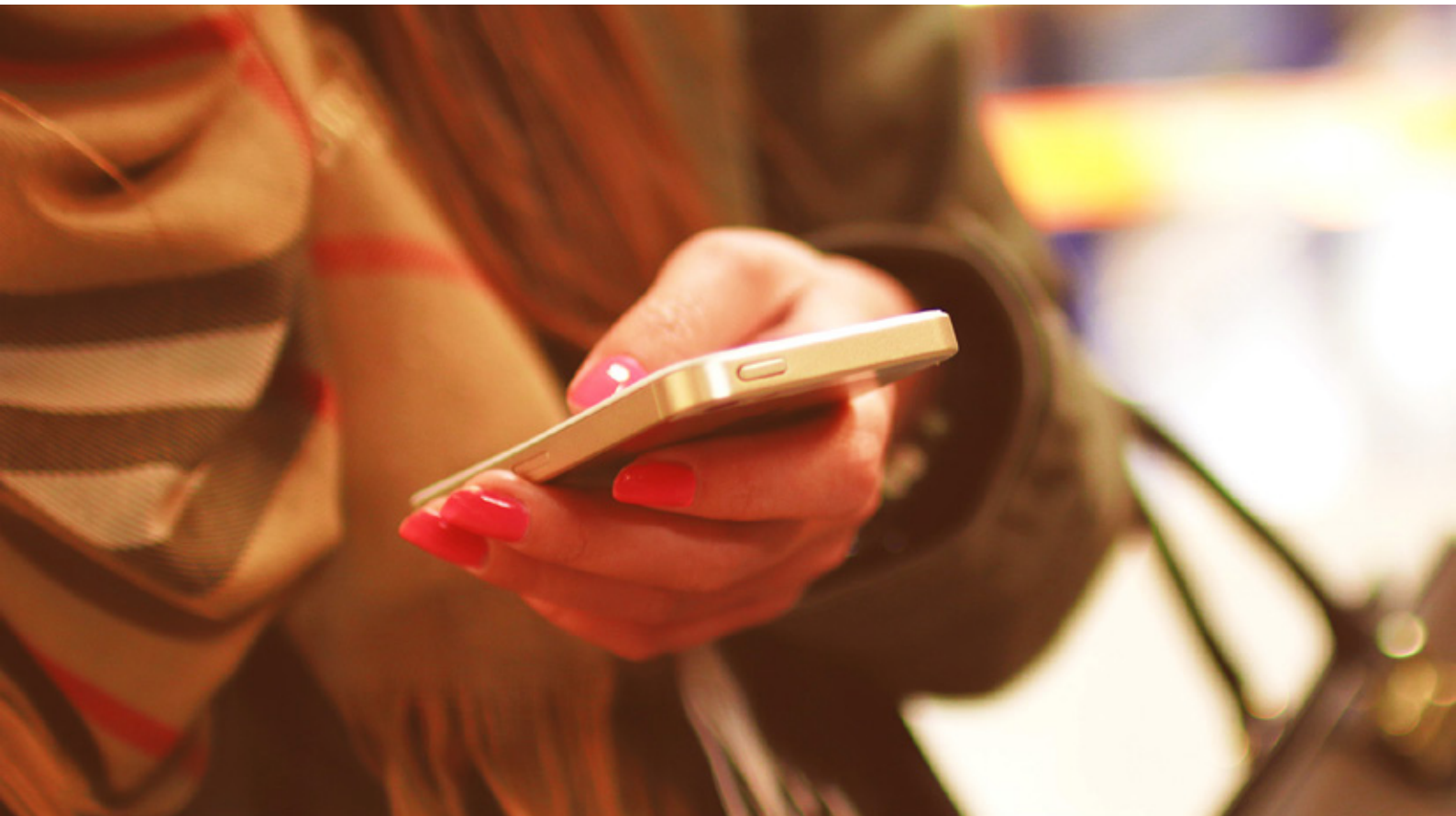
PayPal's founders came together in 1998 and started an online company X.com, with PayPal soon emerging as the chief focus of the company. PayPal quickly identified an opportunity with online marketplaces, which clearly required a way for consumers to quickly and safely transfer money online. In 2000, PayPal partnered with eBay, and its account base rose to 100,000.[43] Today, PayPal has 184 million active customer accounts, is available to people in more than 200 markets, and allows customers to get paid in more than 100 currencies.[44] Peer-to-peer payments are free on PayPal and it earns its revenue through charging merchants for virtual purchases by consumers.

Now, PayPal is being disrupted by other entrants offering "digital wallets". Venmo is a free digital wallet that lets one make and share payments with friends. It is quite clearly targeted at Millennials – the age group most likely to be splitting restaurant and cab bills – and offers social functionality where one can share one's payments on a page that is similar to the "wall" on Facebook. In 2012, Venmo was acquired by Braintree for $26 million, and just a year later Braintree was acquired by PayPal for $800 million.[45]

Outside of fintech companies, consumer tech companies are also eyeing the peer-to-peer payments space as a gateway into the general online payments space. WeChat, a wildly popular social messaging app with many other integrated features including mobile payments, has 700 million monthly active users, out of which 200 million are linked to bank accounts.[46] Facebook is following this example and rolled out peer-to-peer payments through messages in 2015[47], while fellow tech giant Google offers the Google Wallet, allowing instant peer-to-peer payments using an email address or phone number[48].

In the US, many of the peer-to-peer payments platforms are free. Monetization mainly comes through helping consumers connect with businesses. Peer-to-peer payments is a customer acquisition strategy that allows the platform to capture sign-ups easily, and the platform can then be used for purchases from merchants. WeChat already allows users to make payments online with participating retailers[49], and Venmo allows payments to merchants after its acquisition by PayPal.[50] Other platforms are likely to move into this direction.

The trend of integration of payments into messaging apps will also continue. As online peer-to-peer payments become even more accessible from different social platforms, peer-to-peer payments may become more of an extension of communication between friends, and integrated into social sharing capabilities as with Venmo.



VI. International Remittances

According to the World Bank, migrants send back earnings to their families at levels above US$441 billion, a figure three times the volume of official aid flows. These inflows of cash constitute more than 10% of GDP in 25 developing countries. The top recipient countries of recorded remittances in 2015 are India, China, the Philippines, Mexico, and France, and the top source countries are the United States (US), Saudi Arabia, Russia, Switzerland and Germany. The top remittance corridors are US to Mexico ($25.2B), US to China ($16.3B) and Hong Kong SAR to China ($15.6B).[51]

Remittance here refers to a broad range of transactions, which includes personal transfers, compensation of employees, capital transfers between households, and social benefits, with personal transfers including all transfers from/to resident to/from nonresident households regardless of whether the recipient is a family member or not.[52] This means that remittances constitute a large component of all consumer-to-consumer international money transfers and will be the focus of this section.

The international money transfer players include banks, money transfer companies with physical branches such as Western Union and Moneygram, and fintech start-ups utilizing online and mobile platforms. Traditionally, money transfer companies have a physical network of branches, which may be at banks, post offices or shops, and agents within local communities which act as the conduits for money transfers.

According to one report, fintech start-ups are able to charge a quarter of the average price for remittance compared to banks, thus gaining a strategic advantage and posing steep price competition in the industry. Costs are reduced primarily by doing away from overhead from brick and mortar operations. Given that money transfer costs exceed 10% to 20% of the money transfer, there is still tremendous opportunity for disruption.[53]

Technological innovation in infrastructure can also decrease the amount of time for transfers and correspondingly the amount of liability money transfer companies have to bear if money is sent to the recipient before the company receives it. The Ripple protocol, for example, is an open source distributed ledger (blockchain) application that functions as a payment network that supports a variety of currency exchanges. This protocol allows for the exchange of value in real time, as opposed to a day to clear on the ACH network.[54]

However, fraud and compliance issues impose huge costs on fintech startups and traditional money transfer companies alike. Inigio Rumayor, founder of Regalii, a one-stop API for global bill management, lists online fraud as the number one concern that he has encountered. Fraud in money transfer is particularly lucrative, and many money transfer companies offering quick or "instant transfers" often incur a huge liability because money may be sent to the recipient before the money transfer company receives it.[55] Fraud issues are not exclusive to online or mobile set-ups – Western Union lists the types of scams on its website, specifically listing that fraudsters can make contact through telephone or physical surface mail.[56]

Compliance costs may also be a large burden to start-ups. Start-ups in the US, for example, not only need to comply with federal regulations but also state regulations. This means that it may take two years and three million dollars to simply be registered as a money transfer company.[57]

One example of a success story with great social impact is Sendwave. Sendwave allows instant, no-fee transfers from US and Canada to Africa. This is an extremely timely innovation especially given that money transfers to Sub-Saharan Africa remain extremely expensive at an average of 9.53%.[58] While companies such as Western Union and MoneyGram make money on both exchange and fees, Sendwave only makes money on an exchange rate. By offering an online service and saving on physical infrastructure and other costs, Sendwave claims to save its customers $9 on every $100 transfer.[59] Given that money transfers are common within the low-income population, lowering the costs of remittance can increase the effective purchasing power of receiving families back home.

Similarly, B2B companies may also be successful by providing supporting infrastructure. CurrencyCloud is a UK-based provider of cross-boundary money transfer services and has raised $35 million. It counts Azimo, TransferWise and xe.com among its customers.[60]

Because of cybersecurity challenges and compliance costs, new fintech players aiming to compete on costs face low margins. It remains to be seen which fintech players become dominant players comparable to Western Union and MoneyGram.

VII. Mobile Payments

When a payment is made under financial regulation and performed from a mobile device, we refer to it as a mobile payment. Instead of paying with bills, coins, cards or checks, consumers use their mobile device (generally, smartphones) to pay for goods and services.

In addition to the obvious convenience for users (both consumers and firms), this type of payment introduces a huge problem for multiple non-banking companies (from Amazon to Apple and AT&T) that currently have more direct access to transaction data from millions of consumers. This transaction data is extremely valuable, both because firms can use it to increase profits and governments need such data for regulation and tax purposes.

Companies can profit from this trend in multiple ways. Here are some success stories that exemplify some of the ways on which firms have thrived in the mobile payments arena.

- Big companies like Google have entered the arena. In this case, the Mountain View-based giant created Google Wallet, trying to become your go-to mobile payments platform. As in most projects where Google is involved, the biggest value comes not from the operation per se but from the data that such an operation generates.

- Medium-sized companies like Domino's Pizza have also entered the arena. In the case of most retailers, the goal is to facilitate mobile-based consumption. Now, you can order a pizza and pay for it in a matter of seconds. Naturally, the impact is to defend (and ideally increase) market share, revenues and profits by leveraging technology.

- Startup companies like Venmo are created with the sole intention to play in this field. This firm's solution became a convenient way to collect and pay money among friends, and thus attracted acquirers – Braintree bought Venmo in 2012 and then PayPal acquired Braintree in 2013. Six months ago, PayPal announced that it plans to let merchants accept payments through Venmo.

Companies from all sizes are entering this field. Some enter by creating new business units (e.g., Google), others by innovations that complement their current operations (e.g., Domino's) and yet others to be acquired by larger organizations or investment firms (e.g., Venmo).

VIII. Extrapolating the Near Future

"We've entered the most profound era of change for financial services companies since the 1970s brought us index mutual funds, discount brokers and ATMs" – B.I. Intelligence[61]

Incumbents and new entrants into the financial ecosystem are entering into a period of vigorous competition, fueled by technology disruption and consumer adoption. To illustrate some of these battles, we are already seeing a battle between i) traditional banks and online-only banks, ii) retail lenders and peer-to-peer marketplaces, and iii) old-school asset managers and robo-advisors. In each of these three battles, there will be winners and losers on both sides of the table as no enterprise is immune and all firms need to harness the power of new financial technologies. Bitcoin, the first blockchain-based currency, has spread faster than almost any other technology – even the World Wide Web or mobile broadband. Bitcoin was not the first cryptocurrency, and will likely not be the last one. According to Bitcoin Magazine, the very first attempt at cryptocurrencies took place in the Netherlands, in the 1980s[62]. Yet it is safe to say that Bitcoin is now the most recognized and used cryptocurrency of all of this new generation of cryptocurrencies.

In our recently (2016) published whitepaper "Blockchain & Financial Services: the Fifth Horizon of Networked Innovation", we discussed the fundamentals of the technology behind Bitcoin. Blockchain represents a technology innovation that enables transparent interactions of parties on a more trusted and secure network which distributes access to data:

- It has the potential to disrupt not only the financial services industry but also many more, including healthcare, logistics and real estate.

- Venture investment in the Blockchain field was $1 billion in 2015 and is expected to grow to $10 billion in 2016[63].

We envision a near future where Blockchain-based currencies are adopted by millions of people across industries and geographies. It may or may not be a modified form of Bitcoin: there are a number of regulatory and functional challenges inherent in Bitcoin's current iteration. A large number of developers and entrepreneurs are working

to address them.

At the same time, central banks are contemplating issuance of cryptocurrency. The implications of this are manifold, and include a fundamental thread to the financial foundations of extant commercial banks (if you don't need to deposit money into a bank to receive the right to transfer money electronically, but instead can directly transfer money using "Britcoin", the British commercial banks lose an incredibly cheap source of financing: customer deposits).

Aside from cryptocurrencies, the list of other forms of money includes – but is not limited to:

a) Airtime: the use of pre-paid mobile-phone minutes as currency, such as by MIT spinoff company Jana Communications;

b) Gift cards: pre-paid coupons that can be interchanged for products and/or services at selected companies; and

c) Loyalty program-based points: accumulated benefits that can be converted into money for selected brands and firms that compose the group.

These alternative forms of money are still widely used globally. According to The Economist, "Pre-paid minutes can be swapped for cash or spent in shops most easily in Côte d'Ivoire, Egypt, Ghana and Uganda"[64]. Popular retailers, including Banana Republic, Macy's, and Victoria's Secret still heavily promote gift cards. And airlines not only keep on promoting loyalty programs but also push for integration with other companies, so that you can use your flight miles to buy hotel nights, among many other things.

Yet, none of these have come close to the disruption that new-generation cryptocurrencies have introduced.

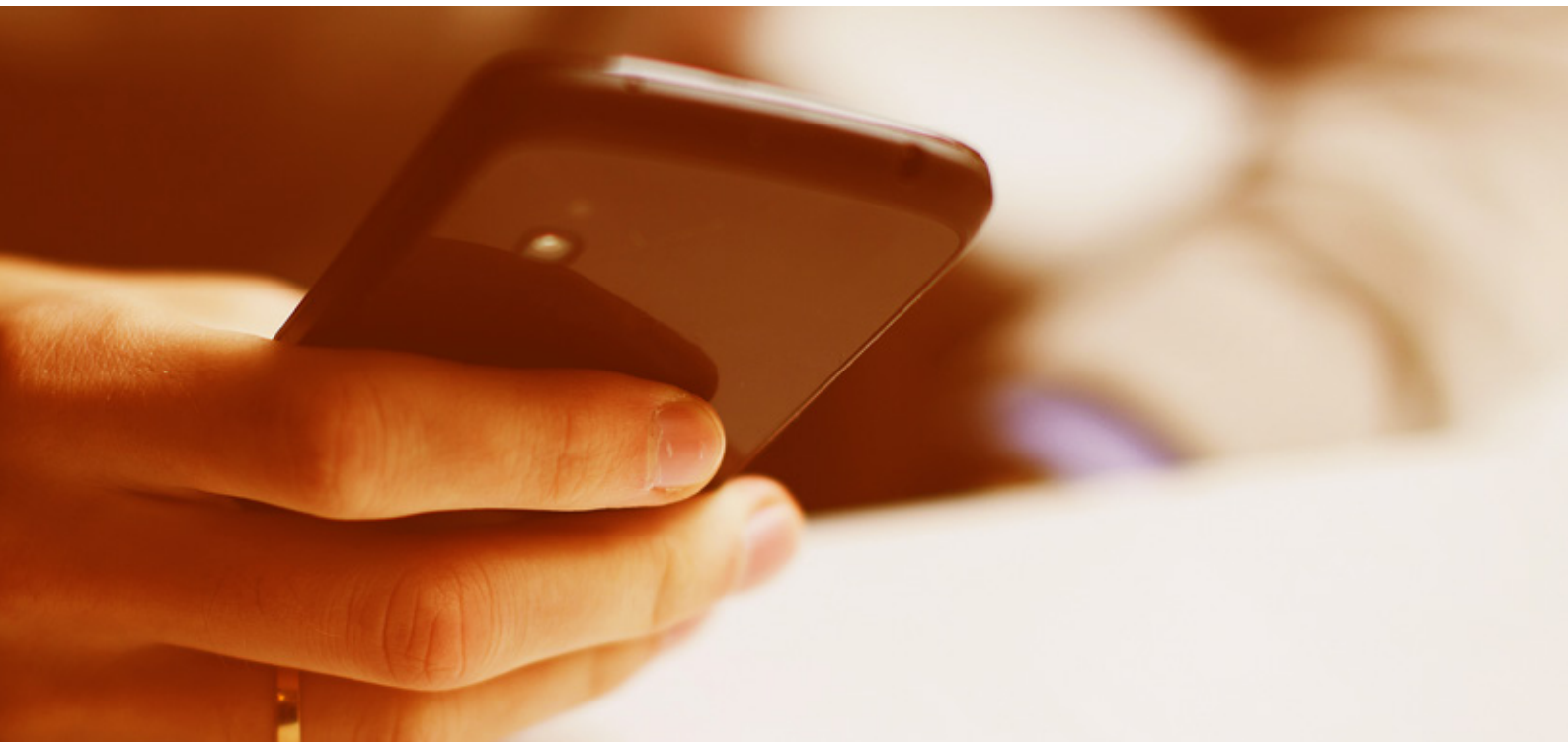
"There is a very real danger that financial regulation will become a wolf in sheep's clothing" - Henry Paulson

It is not the intention of this document to discuss public policy. Nevertheless, it is important to highlight the double challenge that governments face around mobile payments. On the one hand, regulators need to create a norm that satisfies the rule of law and is fair to society. On the other hand, they cannot block innovation. How to balance these two is neither easy nor static, in a sector that is particularly dynamic.

We believe that mobile money and the rest of the fintech revolution will ultimately alter every industry in the economy. Over the following months and years, we expect this to be particularly true around the financial services sectors: payments, lending, retail and institutional banking, asset management, insurance, and markets/exchanges.

Mobile money has introduced a business model that works for mass-markets: high volume and low margins. And as the number of smartphones increases on a daily basis, so does the number of potential mobile money users[65]. With 500 million smartphones anticipated to be deployed in Africa by 2020 (80% of them over the next few years), transformational change to the "last frontier market" is potentially at hand[66].

Entrepreneurial action holds the potential to lead the disruption of the financial ecosystem and deliver better service, at better prices, to consumers. This will come at the cost of stability to the incumbent banks and other financial services market participants. As a consequence we leave you with this question: how can we navigate this disruption with the least harm to society?



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