13

FROM THE DIGITAL DIVIDE TO INCLUSIVE INNOVATION

THE CASE OF DIGITAL MONEY

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Contents

Foreword

Since its inception in 1754, the Royal Society for the encouragement of Arts, Manufactures and Commerce has been deeply interested in understanding and promoting the latest technological innovations. Whether it be the mechanisation of agriculture in the 18th and 19th centuries or the development of closed loop manufacturing products in the 21st, the RSA aims to act as a catalyst for the positive commercial change that arises from new designs and approaches.

However, the organisation has never gone into these endeavours unaware of the downside associated with rapid technological transformation. The RSA has always sought to be as innovative and energetic in addressing the social and environmental issues that can arise from a fast-moving economy as it is in promoting that economy.

This is why we are delighted to publish this report. The authors investigate one of the most radical and rapid changes the commercial world is experiencing in the form of digital money. They show that the changes wrought are already profound and will only get more so.

What is so intriguing about their analysis, however, is their belief that digital money can be used to address some of the most severe marginalisation and deprivation that exists in the global economy. It is an analysis that could hardly be more in tune with the RSA's history.

Increasingly, the work of the RSA's Action and Research Centre is exploring and enabling the interface between digital technologies and new ventures in the private, public and voluntary sectors. This report will prove an important and inspirational contribution to this activity and the work of others exploring a similar space.

Adam Lent
Director of the RSA Action and Research Centre

About the authors

Professor Mark Dodgson researches, teaches, advises and writes about innovation. He is Director of the Technology and Innovation Management Centre at the University of Queensland Business School, and Visiting Professor at Imperial College Business School, London. He is a founding director of the Think, Play, Do Group, an innovation advisory company, and is non-executive director of Nestlé Australia. He has advised numerous companies and governments throughout Europe, Asia and North and South America and has researched and taught innovation in over 50 countries.

He has produced 11 books and over 100 academic articles and book chapters on innovation. His latest books are *High-Tech Entrepreneurship in Asia* (with Marina Zhang), published by Edward Elgar; *The Management of Technological Innovation* (with David Gann and Ammon Salter), and *Innovation: A Very Short Introduction* (with David Gann), both published by Oxford University Press. He is currently editing *The Oxford Handbook of Innovation Management* (with David Gann and Nelson Phillips), also for OUP.

Mark is Editor-in-Chief of *Innovation: Management, Policy and Practice* an academic journal he founded 16 years ago that particularly addresses innovation in developing economies. He is a regular commentator in the Australian national press, writing on business, innovation and higher education. He is a Fellow of the RSA.

Professor David Gann is Vice President, Development and Innovation at Imperial College London and holds the Chair in Technology and Innovation and Management at Imperial College Business School where he was founding head of the Innovation and Entrepreneurship Group and built a portfolio of research in collaboration with design, technology and engineering firms.

David co-founded Imperial College's Digital Economy Lab and the Digital City Exchange – cross-faculty research on systems and services innovation for the digital economy.

David's main interest is innovation strategy: exploring why and how innovation happens, the ways it continually informs the world we live in, and how it can be managed. His research focuses on intensification of innovation using digital technologies to improve collaboration and reduce cost and uncertainty of innovation processes.

David is Chairman of the Smart London board, reporting to the Mayor of London. He is a member of the London Enterprise Panel's Digital, Creative, Science and Technology Working Group, a member of the UK's Information Economy Council and a Trustee and Board member of the Institute for Sustainability.

David has worked with many technology ventures and large engineering and technology firms, including as Group Executive at Laing O'Rourke plc from 2007 to 2011. He advises government and firms on research, development and innovation strategies and in 2011 was a member of the Hargreaves Review of Intellectual Property and Growth.

David was awarded a CBE for services to engineering in the Queen's birthday honours list in 2010. He is a Fellow of the Royal Society of Arts.

Dr Irving Wladawsky-Berger retired from IBM in May of 2007 after a 37-year career with the company, where his primary focus was on innovation and technical strategy. He led a number of IBM's companywide initiatives including the internet and e-business, supercomputing and Linux. In his emeritus role, he continues to collaborate with the company on major new market strategies like Cloud Computing and Smarter Planet.

In March of 2008, Irving joined Citi as Strategic Advisor, working on innovation and technology initiatives including the transition to mobile digital money and payments. Since 2005 he has been writing a weekly blog, irvingwb.com, and in April 2012 he became a regular contributor to the Wall Street Journal's CIO Journal.

Irving is Visiting Lecturer at MIT's Sloan School of Management and Engineering Systems Division, Adjunct Professor in the Innovation and Entrepreneurship Group at Imperial College Business School, and Senior Fellow at the Levin Institute of the State University of New York. He is a member of the Board of Directors of Inno360, ID3 and the Corporation for National Research Initiatives; the InnoCentive Advisory Board; the Visiting Committee for the Physical Sciences Division at the University of Chicago; and the Advisory Board of USC's Annenberg Innovation Lab.

Irving was co-chair of President Clinton's Information Technology Advisory Committee, as well as a founding member of the Computer Sciences and Telecommunications Board of the National Research Council. He is a former member of the University of Chicago Board of Governors for Argonne National Laboratories, of the Board of Overseers for Fermilab and of BP's Technology Advisory Council. He is a Fellow of the American Academy of Arts and Sciences. A native of Cuba, he was named the 2001 Hispanic Engineer of the Year.

Irving received an MS and a PhD in physics from the University of Chicago.

Professor Gerard George is Vice Dean of Imperial College Business School and the Director of the Rajiv Gandhi Centre. The Centre facilitates Imperial College's strategic commitments in India for joint research initiatives and educational programmes in innovation and entrepreneurship. In July 2013 he begins a three year term as Editor of the Academy of Management Journal.

Gerry holds a Professorial Fellowship from the UK's Economic and Social Research Council (ESRC) to work on resource-constrained or inclusive innovation. His work investigates business models, organisational design, and its implications for innovation and entrepreneurship in multiple settings including prevention of mother-to-child transmission of HIV, and rural electrification in Kenya and Tanzania, among others.

Gerry's book on business models (with Adam Bock), *Models of Opportunity: How Entrepreneurs Design Firms to Achieve the Unexpected* was published in February 2012 by Cambridge University Press. Before joining Imperial, Gerry held tenured positions at the London Business School, where he served as Faculty Director of the Institute of Technology, and at the University of Wisconsin-Madison, where he directed the Applied Ventures in Entrepreneurship Program.

From the digital divide to inclusive innovation: the case of digital money

The history of economic development has been characterised by periods of massive transformation brought about by technological innovation. As well as creating new industries, technology transforms the ways we live and work. Steam power led to industrialisation and rapid urbanisation, electricity enabled the assembly line and mass production of consumer goods, the automobile encouraged mass mobility and the development of suburban living, and the internet and world wide web have revolutionised access to communications and knowledge. It is very hard to anticipate the consequences of such enormously disruptive technologies. Technology continues to surprise, seen, for example, in the unexpected growth of SMS messaging and social networking and the massive changes brought about by online media and music.

This pamphlet is concerned with a profoundly transformative technology, one that affects a crucial element of the fabric of society. It examines digital money, a technology that moves economic transactions, payments, remittances, transfers etc, from the physical into the digital world. Just as communications and publishing have been transformed by digital technologies, so too will financial services. The progress of digital money will inevitably surprise us and it will develop in unexpected ways, but we believe it is on the cusp of delivering a remarkable transformation in the global economy. It will end the divide between those who can and those who cannot participate in formal economic transactions. It may usher in a new era of more inclusive innovation that involves billions of more people around the world in constructing the services that affect their future.

The significance of digital money has already been described at the RSA,[1] but this pamphlet goes further by explaining how it is a feature of innovation in financial services in the digital economy. It explains why recent technological developments can profoundly increase such inclusiveness. We discuss the growing use of digital money, highlight its potential, and consider the issues that will facilitate or hamper its reach. We offer broad prescriptions for government policies, business models

1. See: www.thersa.org/events/video/vision-videos/the-future-of-money.

and public-private partnerships around these technologies that will help to bring the previously excluded into the economic mainstream.

Before we do so, it is necessary to explore how innovation in services based on digital technologies differs from our conventional understanding of innovation processes found in industry.

Innovation in services in the digital economy

Services in fields such as finance, healthcare, creative industries and communications comprise the largest component of global economic activity, accounting for around three-quarters of jobs in most developed economies. The service sector includes some of the most knowledge intensive parts of the economy, such as architectural and engineering design and government services ranging from education and transport to bureaux of meteorology.

Services innovate in ways that differ from the traditionally manufactured products of the past, allowing broader participation in their creation. The manufacturing-dominated economies of past decades invariably required expensive infrastructure in the form of research and development (R&D) departments and technologically advanced factories. Some of the major differences in research and innovation between the industrial and services economy are contrasted in a highly stylised form in Table 1. While innovative practices are continually being transferred between sectors, the industrial and services industries have grown on the basis of different principles. The focus in industrial economy has been on understanding and manipulating natural and engineered physical objects and systems. In the services economy there is greater emphasis on understanding and adapting organisational systems comprising information, people and processes. The key objectives of industrial innovation are to develop new products, increase product quality and functionality, and improve production. The overriding objective of innovation in services, in contrast, is to provide a positive customer experience that is often highly personalised so as to encourage people to come back for more.

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Personalisation of services represents a major shift in focus in decision-making from producers to consumers. Examples include personalised health care, with individualised pharmaceutical interventions, or financial services tailored to highly specific circumstances. These are commonly built upon major technological infrastructure and systems. Consider the design of web sites. Every individual, company, and institution can tailor web sites to their own needs and preferences. The content, look and feel of each site is highly personal. These customised elements are only a thin veneer on top of the key underpinning innovation of a very large common infrastructure. Sophisticated tools and platforms allow users to easily design, build and publish their web sites.

Table 1. The changing nature of innovation

	Industrial economy	Services economy
Focus	Natural and engineered physical objects and systems	Organisational systems: people, information and processes
Design objectives	Production oriented, product excellence, competitive costs	Consumption oriented, market-facing, positive customer experiences
Organisation and culture	Siloed within disciplines, narrow, sequential, deep, proprietary	Multi-disciplinary, holistic, concurrent, broad, collaborative, open

Source: Dodgson, Gann and Wladawsky-Berger, 2010

Services are not produced in the laboratories and factories of the industrial R&D era where they can be prototyped, fully tested and optimised. They are often produced at the point at which they are consumed and so the act of consumption rather than invention is the focal point for innovation. Innovative offerings are therefore developed using a 'market-facing' approach, often connected to those people and organisations whose requirements and demands are articulated and expressed during the process of consuming innovation. This is done through shared experiments with users in real time, including with employees, partners, clients and the public at large. In this way, service innovation is intrinsically more inclusive, focusing directly on experiences, appreciating and meeting human needs and market demands.

The implication is that answers to technical problems with the potential to create social and economic value from services will not lie exclusively within research institutions or companies with proprietary R&D cultures, but will emerge through their effective collaboration, especially with the users of those services, and also with wider groups such as specialist suppliers and even competitors (see, for example, Miles, 2008).

The advent of the internet provided an opportunity for hundreds of millions of people to contribute to and benefit from the global economy. Yet the cost of accessing the internet and developing services using personal computers, servers and fixed wire broadband was prohibitive for billions of others, accentuating a digital divide between rich and poor within and between nations. Recent technologies, such as smartphones, broadband wireless networks, and cloud computing that provide huge volumes of services and information, are combining to produce a cheap platform with universal reach available for the first time to billions of the world's poorest people. The barriers that were created by the prohibitive costs of accessing the internet, that excluded those that could not afford $1000-plus personal computers and expensive data storage, are being lifted. Cheap smart phones that can access the internet and use thousands of applications (apps) are rapidly and dramatically closing the digital divide. At the same time the massive increase in available data from trillions of sensors found, for example, in mobile devices, provides opportunities to help make better, quicker decisions using advanced analytical techniques on powerful supercomputers.

Opportunities for greater inclusiveness arise, therefore, in economies where interactions are increasingly conducted digitally, coupled with services that comprise substantial components of gross national product and which rely on innovation that is more and more personalised (see, for example, McKinsey & Company, 2010).

Inclusive innovation and digital technologies

The strategies of large, multinational companies that innovate to reach the markets of the poorest in developing economies, described as being at the 'bottom of the pyramid', have been well documented by academics, such as CK Prahalad (2005), and multilateral agencies such as the United Nations Development Programme. Businesses create opportunities through product innovation that targets consumers with low incomes. Though such low cost innovations increase product use, the economic benefits largely accrue to the businesses themselves rather than individual consumers. In contrast, inclusive innovation involves the development and implementation of new ideas that create opportunities to enhance social and economic wellbeing for disenfranchised members of society (George, et.al., 2012). This broader approach focuses on how individuals and communities can be successfully seeded to co-create and co-innovate, developing new products and services to localise wealth creation. Innovation emerges 'bottom up' rather than 'top down', empowering the people who face particular economic or social problems to design their own solutions to them.

More inclusive innovation will involve localised initiatives building on large-scale technological and service platforms. Apps are emerging, for example, that advise slum dwellers and impoverished rural farmers about market prices, water availability, and medical services. In Africa, MoBiashara is a mobile technology that allows users to search for and purchase products via text message. Umuntu presents local news, job listings, and directories specific to a number of countries such as Angola, Uganda and Rwanda. Ushahidi provides a platform for collecting and sharing crisis information on mobiles.

Inclusive innovation applies to physical products, such as d.light's $15 solar lanterns or the $3000 Tata Nano car, but it is particularly applicable to services and digital products such as microfinancing and mobiles because of the small marginal costs of their production, delivery and replication. Microfinancing provides financial services to individuals or groups of people that are too impoverished to participate in conventional financial systems, and are often prey to exploitation by loan sharks. Opportunities for personal and corporate wealth creation in developing countries are often restricted due to lack of capital. People remain in poverty traps because they cannot open bank accounts and do not have rights to property and collateral to guarantee loans. But access to finance, often guaranteed through mutually owned 'village banks', together with the means to transact, is revolutionising entrepreneurial opportunities.

Systems such as M-Pesa and Bharti Airtel provide new services that allow people to pay others using mobile-powered micro transactions. M-Pesa, operated by Safaricom in Kenya and other African countries, and Bharti Airtel, which started in India and now has expanded throughout Africa and South Asia, provide mobile phone services at very low prices.

Access to capital can increase opportunities, and the availability of micro finance on mobiles overcomes the problems of reach into rural and impoverished areas and allows the previously disenfranchised to participate in the broader economy.

Some suggest that innovative uses of technologies, such as mobile phones, in developing economies have often had more dramatic impacts on banking, trade and healthcare than in developed nations. Such technologies are certainly readily available. The growth of mobile phones has already outpaced personal computers and laptops in penetration and speed of adoption. In 1981 a personal computer cost around $6000 and had a one percent market penetration. In 1994, laptop computers cost around $1000 and had 10 percent penetration. In 2012, mobile phones cost $25–50 and many developed and developing countries, including China and India, have 75 percent penetration. Some, such as Brazil, have over 100 percent penetration. With around 6bn mobile phones in use, just about everyone in the world, rich and poor alike, now has access to mobile devices.

While only a proportion of mobiles are 'smart' – that is, built on a general computing platform with internet access and the ability to run sophisticated software apps – those numbers are going up rapidly. It is estimated that in 2011 almost 500m smartphones were sold, comprising over 30 percent of the total number of mobile device sales. In China more people, nearly 400m, now access the internet by mobile phones than desktop computers. It is likely that in five years, a large majority of mobile phones will be smart.

The case of digital money

Since the world's first gold coins were produced over 2500 years ago in Lydia, western Turkey, money has played a major role in stimulating commerce and economies. Money has traditionally been considered as a medium of exchange and measure of value, allowing economic transactions to be conducted between strangers over time and distance. It has given rise to organised companies and public institutions and has been instrumental in helping communities to become more productive and to improve their standard of living.

For a long time, money was embodied in precious metals such as gold and silver. With the introduction of banknotes in seventh century China, money started to decouple from physical objects with intrinsic value.

As Niall Ferguson puts it: "Today … we remain more or less content with paper money – not to mention coins that are literally made from junk … we are happy with money we cannot even see. Today's electronic money can be moved from our employer, to our bank account, to our favourite retail outlets without ever physically materialising. It is this *virtual money* that now dominates what economists call the money supply."

Given the intangible character of money, it is unsurprising that major advances in information technologies have led to radical changes in the way we deal with money and payments. In the 1960s, 1970s, and 1980s, computerisation encouraged financial innovations such as credit cards and ATMs. The impact of these innovations is profound, with Moody's, for example, estimating credit cards added $1.1trn to private consumption and GDP from 2003 to 2008 (Zandi and Singh, 2010). In the 1990s, the

wide adoption of the internet and World Wide Web led to online banking, online shopping and e-commerce in general. The relationship between information technology and money is now closer than ever, with lending, card issuance, deposits, payments and cash management increasingly conducted using digital media. Trends are clear: there is less and less cash in circulation in economies around the world, and a larger and larger percentage of payments are not in cash. Bills and coins now account for only seven percent of the USA's total economic transactions, and an average of seven percent in the EuroZone. In Sweden, the first European country to introduce bank notes in 1661, only three percent of its economy is represented by bills and notes.

Digital money is a collection of technologies and services that will profoundly affect every society and economy in the world. The transition to digital money involves the transformation of cash, cheques, credit and debit cards from physical to digital objects that we will carry in smart mobile devices. It also encompasses the whole global payment infrastructure, including the management of personal identities and personal financial data.

Digital money will likely not eliminate cash, any more than the computerised office eliminated paper. In both cases, the digital and the physical will co-exist. But there are continuing problems with cash that digital money helps resolve. Notes and coins are unhygienic in the ways in which they transfer germs, and inefficient in the cost of storing, guarding and moving. Cash-based economies have great challenges in tax collection.

Improving the flow of money can provide major economic and social benefits because it reduces time lost in making transactions, queuing for tickets etc, or waiting for receipts or confirmation of payments. It was not so long ago that time was continually lost in waiting for a cheque to be written, paid-in and cleared. Digital money has the potential to remove this 'friction' in transactions, improving and lubricating the flow of economic and social activities. This also has the potential to 'dis-intermediate' financial systems, because the use of digital money no longer makes it necessary to rely on intermediate services. International travellers, for example, have typically relied on foreign exchanges to change money into local currency, often paying much higher exchange rates than interbank spot rates. Foreign exchange companies have profited by running wide spreads between buying and selling foreign currencies. This traditional form of money exchange is rapidly disappearing as travellers are able to use ATMs linking them to their home bank accounts. The prospect of digital money is likely to improve access and flow still further.

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The ways we make payments are changing dramatically. Skidata, the Austrian company founded in 1977, was one of the first to develop mobile payment systems, originally providing electronic ticket access to turnstiles at ski resorts. In the late 1980s it was the first to provide hands-free ticketing. The diffusion of the technology has accelerated and the business has since grown to provide mobile contact-less access and transaction services in a wide range of areas such as sports and events, tourism and car parking.

Consumers are readily embracing payments on smart phones. Major merchants accept mobile payments on the internet and at point-of-sale. Numerous transit and transportation systems use mobile payment

systems. Innovations in 'digital wallets' run on smartphones include just about all the various items carried around in purses and wallets today that facilitate payments. The volumes of payment transactions are likely to go up by a few orders of magnitude over the next decades. Mobile transactions are estimated to increase from $60bn in 2010 to $1.13trn in 2014, growing at 95 percent annually.

Fewer than two billion of the world's seven billion population have bank accounts, so the vast majority is excluded from this essential economic infrastructure. As well as absence of collateral to guarantee loans and liquidity to facilitate transactions, problems are compounded by lack of physical access to banking facilities in rural and remote areas. Microfinancing is overcoming some of these constraints, but not well enough. In contrast to the billions of people disengaged from the banking system, the six bn mobile phone users worldwide bring unprecedented levels of connectivity. Banks and financial service companies are increasingly adopting mobile technologies to allow digital money transactions for millions for the first time. Indeed the impact of digital money will have a particularly profound effect on the world's poorest, which is why organisations such as the World Bank and Bill and Melinda Gates Foundation are taking a strong interest in its implications and possibilities (see Bill and Melinda Gates Foundation, 2010).

Cash is especially disadvantageous for the poorest, who do not have the security of bank safes for their savings and are hampered by the inconvenience of transactions needing to be face-to-face rather than conducted electronically. The poor have no choice but to use cash.

The emergence of digital money, which by receiving and making payments at such an increased scale lubricates the flow of innovation and economic development for all, including the poorest, presents both major opportunities and threats for citizens, corporations and governments.

Citizens no longer excluded from the global economy are vulnerable to cybercrime and inappropriate use of personal information. There are dangers in lenders naïvely over-stretching with easily available finance and being unable to repay loans. Large companies are confronted with both the possibility of new entrants with disruptive technologies and business models and significantly cheaper costs, and massive new market opportunities. Small companies, such as those supplying farms, or local cooperatives, have better information, but may face more competition. Those that cannot connect digitally will be left behind and eventually driven out of business. Governments have the potential to leverage these technologies and attain cost savings for better public governance. With universal access to digital technologies the need to provide services manually and physically is removed, but governments and firms are also confronting issues of data security and privacy.

Challenges: Security and identity

The technologies that facilitate greater inclusion already exist or are in development, and the most difficult challenges to be confronted in its realisation are political and institutional. Universal participation requires resolving the incredibly complex problems of establishing secure digital personal identities and developing the capacity to privately store and process individual data.

Money is inexorably linked to the issues of secure identity and trust in payment systems. Secure transactions have to prevent attempts to steal identities for criminal purposes, and placate the fears of consumers about the consequences of losing their phones. There needs to be trust in the system that strangers will honour transactions. Transactions security, precluding errors and preventing crime, requires confidence in the identity of individuals, as access to the global digital economy is built on the assurance that people are who they say they are. The transition to universal digital money, therefore, has to be accompanied by a similar transition to universal digital identity management and systems that people trust to guarantee privacy. These are hard problems, requiring considerable innovation amongst large technology and financial service companies to provide robust technical systems, and in governments, especially in emerging economies around the world where a significant portion of residents remain barely connected to their administrative and financial systems.

Nations such as India and Estonia have embarked on massive programs to allocate such identification. Through its Unique Identification project India aims to issue each resident a 12- digit unique number, which will be stored in a centralised database and will be linked to basic demographic and biometric information. This project has already registered 200 million people and, among other benefits for the poor and underprivileged, gives them access for the first time to the many services provided by the government and the private sector. There are plans to increase the number of people registered to 600 million by 2014. Before long, it is possible that smart mobile phones will include a variety of biometric features, including fingerprint and retinal recognition for those transactions requiring a higher measure of security. India's strong information technology capabilities, in firms such as Infosys and Tata, will make important contributions to these developments.

The prospect of quantum cryptography offers an even more radical possibility for dealing with concerns over security and privacy of data in digital transactions. Quantum keys are used for encryption of passwords. They are secure because any attempt to interfere with the data is detectable: if quantum data is accessed it changes, thereby hindering attempts to break security codes.

Another key challenge to be resolved lies in the ability to manage and store personal information, while guaranteeing privacy in the maintenance of records and ensuring the continuing openness of access for consumers. The possibility of criminal or state-sanctioned invasions of private data on health, finance and movement is real, and broader participation in the digital economy depends on any such concerns being alleviated.

Challenges: Emergent technological systems, unpredictable outcomes

While all the trends we have discussed are real and currently occurring, the future development of digital money and its use is unpredictable. Digital money exists as part of a whole money system, including the global payments infrastructures, the management of personal identities and financial data, the global financial flows among institutions and between institutions and individuals, and government regulations. As a

result it is impossible to 'pick winners' and suggest which technologies, services and apps will predominate in the future. The high level of unpredictability results from the complexity of the global financial system, and outcomes will involve resolution within businesses and governments of evolving technology and consumer choices. This resolution depends, we argue, on government policies and business models that involve extensive collaboration and experimentation.

Business models

The case of digital wallets shows how different vendors in these technologies are developing their products and services based on markedly different designs. No technical standards have emerged that all vendors are willing to embrace. There are numerous industry consortia designed to promote mobile payment standards, and these reflect widely differing concerns. There remain broad differences in choices in technology and whether consortia of collaborating firms are led by financial institutions, mobile operators or mobile equipment manufacturers, Americans, Europeans or Asians, and the extent to which there is engagement with small start-up companies (see Zhang and Dodgson, 2007).

The existence of these different consortia, and the preparedness in some cases to belong to a number of them, reflects the continuing uncertainties around the development of the industry. Decisions about who to collaborate with in 'standards wars' is an important element of strategic positioning in such emerging industries and the process and outcomes of standard creation are an important issue for governments. Establishing a voice on international standards bodies, along with the high-level technical expertise required, presents a significant challenge for developing economies.

Establishing a voice on international standards bodies, along with the high-level technical expertise required, presents a significant challenge for developing economies

Because the whole money system is increasingly going digital, there are advantages in partnerships of various institutions from different industries. The Google Wallet initiative, launched in 2012, is a partnership between Google, Citi, MasterCard, First Data, Sprint, a number of merchants and other vendors. ID^3, a non-profit organisation recently founded to develop open source frameworks for the protection, sharing and monetisation of personal data, involves a growing number of collaborating institutions. By its very definition, building a digital money system requires broad collaborations and partnerships, and there are considerable advantages for inclusiveness when partnerships pursue open rather than proprietorial technical standards.

New businesses have emerged to provide digital money services by bringing diverse companies together. Monetise plc, for example, was formed in 2003 to create a platform through which buyers, sellers and banks can exchange financial details. It has grown rapidly to become a key player in the provision of mobile banking and payments services.

Another example of the kinds of collaboration being seen is the $50m joint venture between the financial company Citigroup and América Móvil, a Mexican telecommunications company, aiming to provide mobile banking services to millions of people in Latin America, starting in Mexico. Building bank branches in these nation's remote regions is difficult and expensive and this alliance will allow customers to use basic mobile phones to set up bank accounts, transfer money, withdraw cash from ATMs, make purchases in stores, receive payments and pay bills.

Another example is the charity, ActionAid, working on a communications project in Kenya with infoasaid, a venture involving Internews and BBC Media Action, and funded by the UK's Department for International Development. This project uses basic mobile phones to give local people vital information on food and livestock prices and food distribution.

Opportunities for inclusiveness increase when governments and NGOs contribute their data, knowledge and expertise to such partnerships and are prepared to source services from them. An example is the USAID-Citi alliance to accelerate mobile money adoption that has initially targeted Columbia, Haiti, Indonesia, Kenya and the Philippines, to be followed by Peru, Tanzania, Uganda and Zambia.

Digital money provides threats and opportunities for incumbent firms in developing and developed economies in banking and financial services, and internet, mobile and software companies, and it creates incentives for new entrants. As well as producing new sources of disruption in business, digital money also increases prospects for social entrepreneurship. We are likely to see many more public-private partnerships such as SMS for Life, which uses mobile technology to manage and distribute stocks of medicines in Sub-Saharan Africa.

The fundamental technologies of the internet and the web are relatively simple. Their tremendous power and success has come from all the marketplace innovations they facilitate. The best strategy and business models have to be discovered in experiments in the marketplace. The various offerings and apps have to be tested in customer trials until they succeed or fail. Similarly, the development of digital money and payments requires considerable experimentation, bringing with it innovations that can be barely anticipated. Successful digital entrepreneurship will require a tolerance of experiments and their inevitable associated failures and opportunities for learning along the way.

Government policies

Governments have a duty of universal reach, engaging with all their citizens. Whether in developed or developing nations, all governments can find efficiencies through processing digital rather than cash transactions and all need to determine how best to utilise their digital connections with citizens and businesses for better policy formulation and delivery. The benefits of universal access for federal, regional and city governments include the digital delivery of remittances, provision of healthcare and educational services, and better resource flow by, for example, managing peak demands for energy and transportation. The cost savings in delivering social welfare payments are likely to be substantial.

Many governments, and agencies such as the UN, support the movement towards 'Open Data'. Providing access to data about government services improves transparency and allows businesses and citizens to better formulate and articulate their demands for improving the services they use. In 2012, the World Wide Web Foundation published the first Web Index, which, by combining over 80 indicators to evaluate access, affordability, institutional and policy environment and social and economic utility, ranks countries' performance with the Web. The UK is ranked third and highest for overall Web content. The UK government receives a high score in the recent UN e-government online services index. It makes

data available through data.gov.uk, while the Greater London Authority makes much of its data available through data.london.gov.uk, including a London data dashboard on matters such as jobs, health, and policing. Whether it is London's dashboard or Rio de Janeiro's emergency response tool that integrates data on transport, weather and available medical facilities to allow better management of extreme events, these technologies are significantly increasing government responsiveness and accountability.

Because of the unpredictable and emergent nature of such innovations, the most effective role of government is to demonstrate, catalyse, and provide infrastructure and produce regulations to ensure competitive provision of services and their secure and private access. Standards are needed to ensure that systems will connect with one another. Regulations are required to limit abuse such as setting exorbitantly high interest rates in microfinancing schemes. The danger lies in governments focusing their efforts on attempting to control the emergence of the technology and the creativity and innovation it encourages, rather than addressing the factors that will bring greater inclusiveness.

In conclusion

As is usually the case with major paradigm shifts, it is difficult to anticipate the changes that digital money will bring about and how long they will take. At some point, a critical mass, or tipping point, will be achieved and progress will significantly accelerate, bringing with it innovations that we can hardly begin to anticipate.

The processes of inclusive innovation and further development of digital money are likely to require more collaboration in the money system between R&D-intensive digital infrastructure providers, governments and local service organisations. Further work is needed, for example, to develop and implement robust, reliable and resilient digital systems on which virtual transactions take place. The development of these platforms and associated security is likely to require expertise found in some of the most sophisticated digital businesses, whereas the applications of relevance to local users may well be developed by small entrepreneurial organisations closely associated with local communities.

The potential of digital money is extraordinary. It could prove to be one of the most transformative technologies of all time. For billions around the world, digital wallets containing digital identities, money and accounts are a ticket to inclusion in the global economy. In addition, the emergence of this platform for inclusive innovation will usher a plethora of apps and services, many of which we can barely imagine today. The innovations that digital money will induce will increase opportunities for wealth-creating entrepreneurship and the provision of highly localised innovations, thereby increasing standards of living and quality of life.

Digital money will liberate the poor from the constraints of the cash economy. It will alleviate the poor from the drudgery of dealing with bureaucracy, such as the relentless queuing for paying utility bills, and the need to transact face-to-face, providing the great resource of time. More time will be gained for productive activities. Such incentives will encourage investment in developing the skills and capabilities needed to effectively use the new access to technology and capital. There are reasons to be optimistic about the opportunities being brought about by

the integration of mobile technologies into the fabric of contemporary economies. There are many challenges, but these are in the process of being addressed through a variety of experiments and collaborations that are important to encourage and maintain, especially when they involve parties from the public, private and NGO sectors, and the developed and developing world.

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