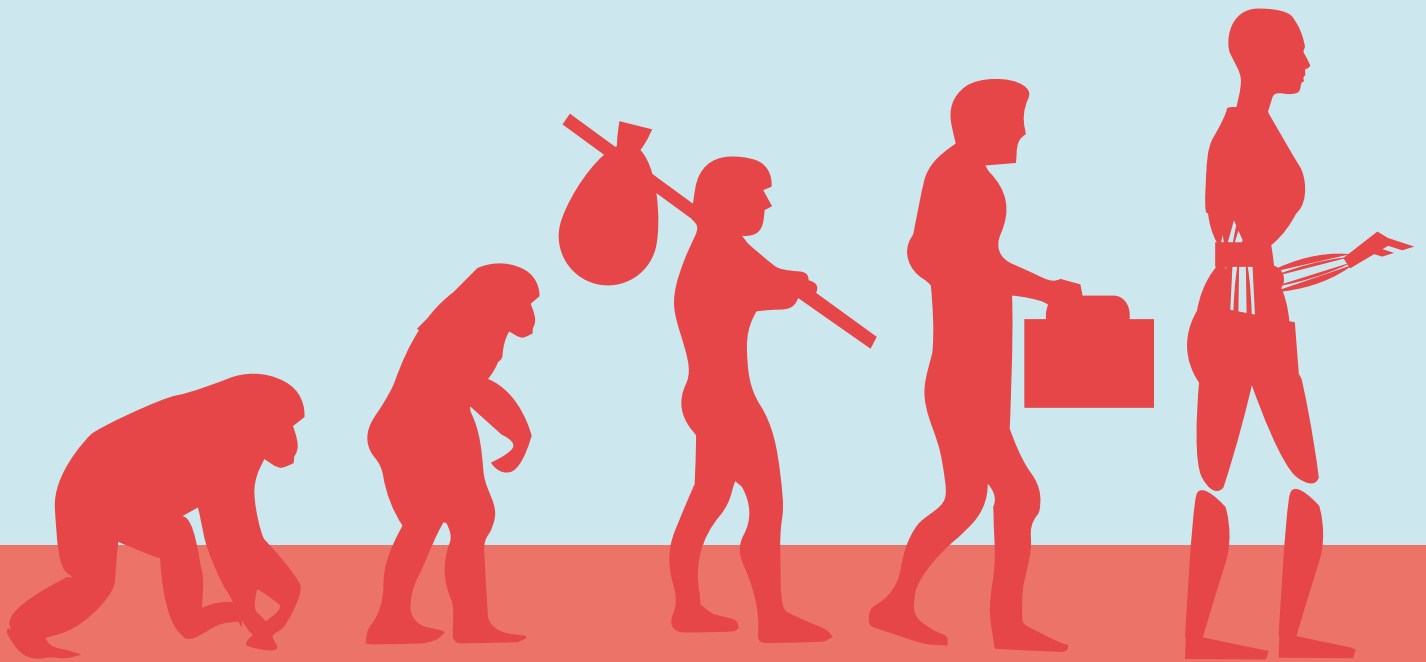


THE *FUTURE* OF **FINANCE**



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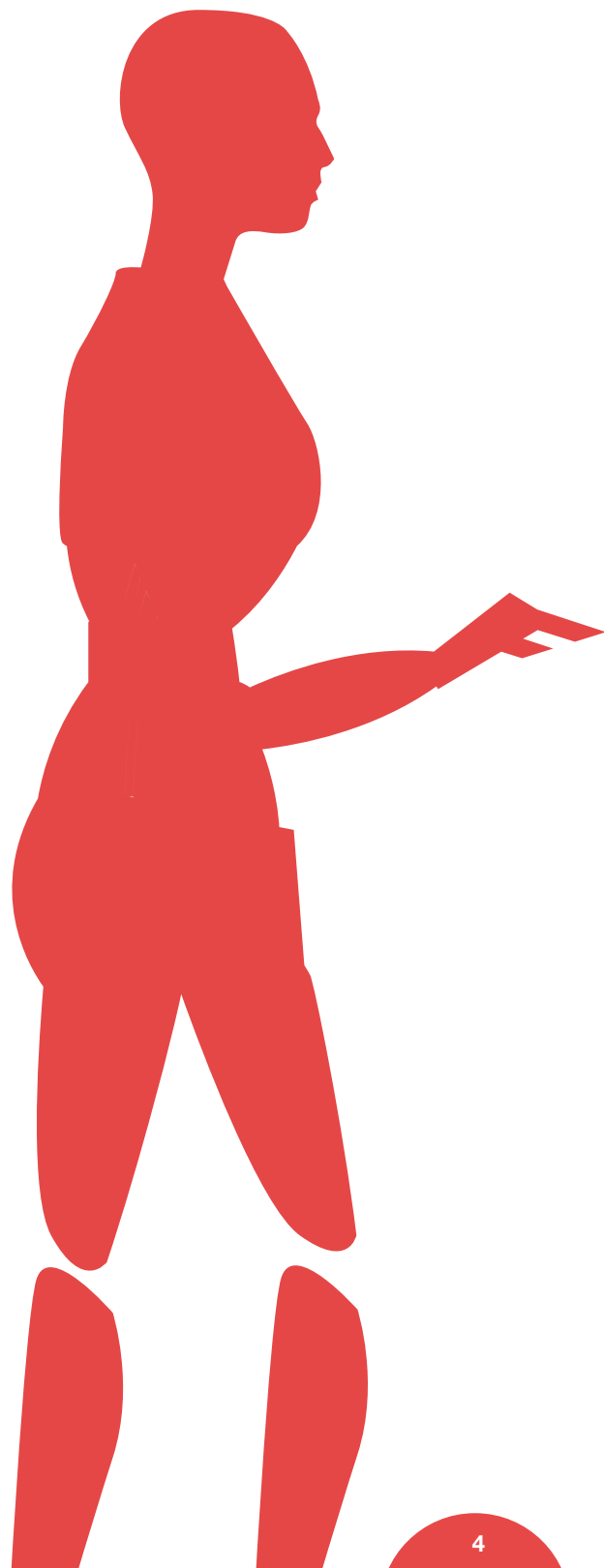
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WELCOME



This book represents the output from the second 'Future of Finance Conference' run by FiNexus and its partners and associates. The aim of the conference was to discuss challenges and issues in the financial services sector in an independent and collaborative fashion involving a wide array of stakeholders: Traditional economists, 'new' economists, quant scientists and mathematicians, high-powered computer scientists, innovators, policy-makers, regulators, and, of course, the financial services industry. The first conference in 2013 covered structure, regulation, ethics and innovation. The Future of Finance 2016 discussed how new technologies and a more adroit use of data are on the cusp of transforming financial services and society

The UK Government has been extremely pro-active in promoting new technologies for the sector. Two Blackett Reviews carried out in the past twelve months by the Government Office for Science, one on Fintech and the other on Distributed Ledger Technologies, have provided accurate analysis of these technologies and have guided regulatory, industry and government policy. I urge you to read them. In addition, there are initiatives, both public and private, that are aimed at developing applications for these technologies, including a distributed ledger laboratory in Leeds. This latter initiative is particularly interesting as it involves the full range of stakeholders relevant to the Future of Finance: Public sector, private sector, entrepreneurs and academia. As such it is the opportunity to achieve great things.

So we are at the threshold of what could be a revolution: machine learning, artificial intelligence (AI) and the emergence of quantum computing; access to new data in bewilderingly large quantities; whole new ways of extracting information from data; the ability to value, settle and clear financial products in real-time; the tools to meet the burgeoning demand for transparency and better environmental, social and governance credentials; and fresh techniques to address demographic challenges. All of these will and are impacting the way the financial services sector does business, as well as the way we transact our business with the industry. Will we be safer? Will we be wealthier? How should we regulate without restricting growth? These were just some of the questions posed during the conference, and tackled in this book."



Chris Sier

Foreword

The Turing principle holds that it is possible for a computer to replicate any physically possible object, environment or process. This proposition ought to shock people. After all, it claims, on the basis of uncontested assumptions about mathematics, physics and biology, that a single physical system can simulate any other system in the universe. Our confidence in the possibility of artificial intelligence is no more than a logical deduction from this fundamental principle of computation.

Yet the failure of the Turing principle to astonish us is easily explained. Almost everybody alive today intuitively understands its truth, whether they have heard of it or not. In the 21st century it is impossible to design an aircraft, or perform calculations on a spreadsheet, or play a computer game, without tapping into the power of digital simulation. It is precisely because the Turing principle is already at work in almost everything our civilisation produces or attempts that people fail to be shocked by its implications.

Complete fulfilment of the Turing principle will of course take prodigious quantities of energy and material, and of memory in particular. But our best theories of physics and engineering are already delivering exponential increases in computer processing power and memory, and equally exponential decreases in the costs of these technologies. The reduction in the ratio of price to power in digital technology is having a profound impact on the structure and evolution of every industry, and finance is no exception.

This is not surprising. Every economy, let alone every industry within it, is at bottom no more than an expression of prevailing technologies. Industries change as technologies change. Technology creates industries and it destroys them. The challenges it sets, and the problems it spawns, summon fresh technologies to solve them, including new forms of ownership and organization, which in turn make possible yet further technological innovations.

By this constant process of challenge and response, technology creates opportunities. New entrants, with nothing to lose and much to gain, are often better placed to exploit these opportunities than incumbent businesses trapped by legacy technology, clients or regulation, or by the sheer inertia of size. So it is not surprising that FinTech ventures are attracting not only billions of dollars in investment, but some of the finest minds in business and academia today. Of course, much of this money and time will be wasted. Every modern technological revolution, from the steam age to the Dot Com era, is rich in failed ideas and experiments. In fact, the propensity of failure to outweigh success is characteristic of every evolutionary process,

including the history of capitalism. But we can be confident that what will emerge from the flux will be novel combinations of technologies, methods of manufacture and distribution, and of markets and organisations.

Those novel combinations will not be mere disruptions of prevailing commercial technologies - in other words, new and better ways of producing or distributing what we are producing or distributing already - but entirely new products and services and ways of living and working and trading with each other. While it is tempting to see technology as providing nothing more profound than ever more efficient solutions to the problem of efficiency, this is to underestimate the creative power of digitization.

Every aspect of the current structure of financial services will be replaced by new arrangements. All that remains to be decided is the pace at which established enterprises are crushed, intermediaries displaced, capital structures rearranged, asset classes abandoned, savings vehicles capsized, old asset classes supplanted, and familiar organizational forms overturned. It is the semblance of continuity in a landscape changing imperceptibly but fundamentally which makes the contemporary sceptic seem wise.

Ironically, the ultimate governor of the speed of the reconstruction of the financial services industry is likely to be the primitive state of finance as a science. Unlike medicine, or the law, or engineering, the ideas and principles which underlie the activities of financiers forfeited, in the great financial crisis of 2007-09, the status even of hypotheses. New explanations, free of dependence on the fallacious notion that sound theories can be derived from observation, are needed before finance can become artificially intelligent.

This lack of a sound theoretical basis for modern finance means that better-equipped industries will be transformed by technology long before banking, fund management and insurance. But it also means that finance is at the starting point of a great adventure. Our second Future of Finance conference, like the first, aimed to encourage those embarking on that adventure, remind them of the value of their explorations and discoveries, and above all to reassure them that they are not alone.



Dominic Hobson



Opening keynote: TISA Agents for change: the digitisation of financial services

Peter Smith, Head of Strategic Policy Development, TISA

Peter Smith, head of strategic policy development at the Tax Incentivized Savings Association (Tisa), which represents all parts of the savings industry, explained the reasoning behind the digital identity project Tisa is leading in conjunction with 50 companies in the industry. Its principal purpose is to make it easier for low and middle earners to engage with the savings industry.

At present, opening even a simple savings account or cash Individual Savings Account (ISA) requires a passport, a birth certificate, and two or three utility bills as proof of identity. Surveys suggest 30 per cent of households in the United Kingdom have less than £250 in savings, and a further 20 per cent less than £1,500. Tisa believes that mandatory enrolment into

“With digital identities, paper documentation will be eliminated. The expectation is that the reduced processing costs will be shared with consumers, in the shape of lower transaction costs”

company pension plans will not rectify the savings shortage because contribution levels are currently set too low.

With digital identities, paper documentation will be eliminated. The expectation is that the reduced processing costs will be shared with consumers, in the shape of lower transaction costs. Tisa is also hopeful that digital identities will make it easier to unite consumers with unclaimed assets, whose value for financial institutions is now offset by regulatory requirements to identify beneficiaries. This task has emerged as a sizeable administrative problem for banks and fund managers.

Counter-intuitively, given the history of resistance to identity cards in the United Kingdom, the government has chosen to support digital identity despite concerns about its impact on civil liberty. Market research to prove the concept found consumers both young and old felt more comfortable about the idea when it was explained that digital identity was backed by the government as well as the savings industry. The government is pursuing a digital identity project of its own, called GOV.UK Verify, for people to prove their identity when using digital government services.

Tests of the use of digital identities to open savings accounts are being conducted with Legal & General and Liverpool Victoria. A digital identity project group at Tisa is devising open standards for firms to offer products and services to consumers on the basis of their digital identities. As long as the United Kingdom remains a member of the European Union (EU), these standards will also be approved by the EU regulators. Work is also in hand, with credit scoring agencies such as Experian, to incorporate initial and continuing Know Your Customer (KYC) and Anti Money Laundering (AML) checks.

However, a number of issues have yet to be resolved. Among them is how and where to store the data that underpins digital identities. Another is security. Consumers are expected to control and maintain their data, so responsibility will rest with individuals. Tisa is working on a solution to the risk of a digital identity being stolen, with certification providers (such as Info-Cert) likely to play an important role by collecting and storing documentation in digital form.



First panel: How can we use technology to restore trust in financial services firms?

Danilo Cattaneo, CEO, InfoCert & Chairman, DTCE

Daniel Godfrey, Independent Director and Consultant

Ravi Jagannathan, MD & CEO, Y-Cash Software Solutions and Chairman & Founder, KrypC Technologies

Alan Morrison, Professor of Law & Finance, SBS, University of Oxford

Moderator: Emanuela Vartolomei, Founder & CEO, All Street Research

With EY predicting that use of Fintech by consumers will double in 2016 alone, chiefly on grounds of convenience, the question of how Fintech companies can secure and retain the trust of their customers is becoming urgent.

An obvious solution presents itself. This is for digital trust service providers such as InfoCert, which collect and store personal credentials in digital form, including video interviews conducted via web cams, to add convenience to the on-boarding process. This obviates the need to obtain paper documentation and a wet signature, which is the principal source of cost for providers and exasperation for customers.

Time will also be a factor, since much depends on the withdrawal of existing providers and their replacement by FinTech alternatives. The early adopters of FinTech services can help to build and spread confidence in FinTech brands. Stored digital IDs can assist that process by making it easier for FinTech pioneers to transact business without the need for further documentation, subject to assurances that data will remain confidential and safe from theft or misuse.

However, existing providers have left a poisoned legacy, which technology alone cannot overcome. Scandals in payment protection insurance, foreign exchange and interest rates, coupled with relatively high levels of compensation - mean compensation in fund management is £225,000, against £27,000 in supermarkets, £80,000 in motor manufacturing, and £130,000 in oil and gas - have persuaded consumers that financial intermediaries abused their trust, seeing them not as customers but as people to be exploited for financial gain. The bonus culture in banking certainly rewarded sales and revenues over doing a good job for the customer.

Technology has taken advantage of this lack of trust in incumbents, but only in limited areas. For example, consumers buy insurance through on-line price comparison sites not only to save money, but because they do not trust banks, insurers and brokers to offer them the best deal. Similarly, consumers are reluctant to buy savings products from banks because, although they trust banks with their money when it is being used as a medium of exchange - in other words, to settle their cash payments - they have no confidence that the banks will

use their scale to obtain better prices for them when taking their money as savings. Instead, they expect to be offered poor returns after the banks have extracted their own fees from any investments. **The banks have not yet suffered from these low expectations because FinTech alternatives do not yet command consumer confidence in the use of money as a medium of exchange.**

An interesting question is whether existing providers can use technology to increase their own trustworthiness, through higher levels of disclosure and communication. They could, for example, open their products and prices up to scrutiny to prove they are operating in a trustworthy way. This would represent a radical change of direction for banks in particular, which have in recent years accepted the costs of litigation and regulatory fines (including for mis-selling) as part of the price of being in business. However, true trustworthiness requires more than an alignment of interests. The banks will have to prove that they take the position of the customer into account before giving advice.

“The early adopters of FinTech services can help to build and spread confidence in FinTech brands. Stored digital IDs can assist that process by making it easier for FinTech pioneers to transact business without the need for further documentation”

At present, trust is less important to both banks and their customers because of increasing use of formal methods of recourse, such as litigating legal contracts in the courts, suing for compensation, or appealing to regulators for redress. However, this contractarian approach does further damage to the idea that banks are in the position of a fiduciary. Indeed, an unfortunate accompaniment to this contractual formalism is the decay of informal controls. In this environment, technology could actually make matters worse, by crowding out informal or tacit human ties and controls, and making corporate cultures more brittle precisely because customers are less loyal and can move their business around more easily.

There is a view that technology cannot rectify moral-cultural problems of this kind. It certainly cannot unless it lengthens its time horizons beyond the need for speed. Even technology-based service providers need to take responsibility for educating consumers about the links between risk and reward, so they are not disappointed by the unavoidable contradiction between high returns and low risks. By using data and technology, FinTech firms can introduce consumers to the notion of taking greater risks where they are able to invest for longer periods.



Second panel: How can we use technology to replace expensive human intermediaries?

Nici Audhlam-Gardiner, Managing Director, Saga Investment Services

Anish Mohammed, Advisory Board Member, Blockchain Advisory Group

Robin Hanson, Associate Professor of Economics, George Mason University

Jaidev Janardana, CEO, Zopa

Anders Sandberg, James Martin Research Fellow, Future of Humanity Institute, University of Oxford

Devika Thapar, Financial Services Lead at IBM Watson Group, UK & Ireland

Moderator: Genevieve Leveille, CEO, KrypC

Digital technology has not changed finance much in the last 40 years, so why should the same technology change anything now? The reasons to hope that it will include the fact that the cost of powerful technology has fallen, trust in incumbents has collapsed, and the younger generation prefers digital interaction. Even the over-50s, who are already banking on-line, can be expected to use technology for reasons of convenience too, such as Skyping the bank manager.

A lot of financial decisions - which mortgage? which loan? which bank account? - do not require expensive advisers, precisely because the decisions are based primarily on prices set in advance. Technology is already helping to solve the problem in more complex decisions. Human advisers persist because they listen to the customer and offer advice. Consumers like the idea of picking a trusted adviser to deal with a difficult problem, because they want to entrust the problem to someone they trust. But even trusted advisers can eventually be replaced by artificial intelligence (AI), though advisers creating AI may be reluctant to code machines that put the interests of the customer ahead of that of the firm. A substantial problem in finance is that professional advisers too often fail to meet the definition of a professional: that is to say, always placing the interests of the customers ahead of the interests of the firm.

Studies show that people are actually happier talking to robots rather than face-to-face to another human being, especially about simpler products, because it enables them to avoid disclosing their ignorance. Consumers also recognize professionals, such as wealth advisers and doctors, over-complicate explanations in order to protect their position. In future, robo advisers - or apps, as they are likely to become - could develop informal reputations and formal ratings based on the quality of the advice they gave to other users. These have the

“Studies show that people are actually happier talking to robots rather than face-to-face to another human being, especially about simpler products, because it enables them to avoid disclosing their ignorance”

potential to impart to AI devices a prestige equivalent to that enjoyed by conventional professionals outside the world of finance via traditional social structures. However, AI is more likely to gain traction because it provides disinterested advice on when to buy and sell, and not because it develops a relationship of trust with customers.

This transformation is not imminent. Although AI machines such as IBM Watson are already able to read unstructured data and converse with users in natural language, and its application to finance - in understanding market sentiment through social media, for example - is obvious, there is an absence of plausible financial theory to underpin its decisions. This helps to explain why robo advice is currently not at all robotic: it is mostly little more than on-line form filling. In fact, AI is poised to disrupt medicine before financial services, where the body of underlying explanatory theory - in other words, well-substantiated, unifying explanations for a set of verified, proven factors, backed by evidence - is much better developed. The ability of robots to converse in natural language (like a physician) and read unstructured data (such as medical journals) is also more readily applicable in medicine than in the more arcane argot of finance.

A lack of even hypothetical (as opposed to theoretical) diversity has already emerged as a problem in insurance, where the use of catastrophe prediction models is replacing human experts but the models have proved to be highly correlated. This has created a risk of herding, or concentration of risk, in the models. Open source modelling is one way to mitigate that risk. The problem of models incorporating incomplete or overly homogeneous financial hypotheses that prove false when tested is not one that technology can overcome unaided. Human beings are more alert to the caveats that surround any hypothesis. This argues for the retention of human intermediaries as a fail-safe mechanism in current models.

Even though human beings are happy to discuss some financial products with robots, more complicated forms of advice require changes in how people interact with technology. Holographic projections, for example, might aid decision-making and retirement scenario planning, as might drawing on computer game and mobile telephone technologies. The application of computing power to run a Monte Carlo simulation is a trivial problem by comparison with explaining retirement to people without specialist knowledge.



Third panel: How can we use technology to lower the barriers to entry to financial markets?

Steve Beauregard, CEO, GoCoin

Tom Britton, CTO, Syndicate Room

Nick Davies, Richer Data Strategy Lead, DWP

Steve Podmore, Founder, BIGCrowd

Nir Vulkan, Associate Professor of Business Economics, SBS, University of Oxford

Moderator: Con Keating, Head of Research, BrightonRock

One obstacle to financial markets being opened up by technology in the same way as hotels, bus companies and taxi cabs is regulation. Uber, for example, had to attract investors that were comfortable with the knowledge that they were investing in a business that transgressed regulatory barriers. Investors in financial services are bound to be more cautious about risking regulatory disapproval. Another potential problem is taxation. Technology-driven pooling or sharing of resources, for example, has not yet attracted the attention of Her Majesty's Revenue and Customs (HMRC), and will look less attractive when it does..

The time taken to be authorized as a provider of financial services is a more immediate barrier to entry. A crowd funding platform can be open for business as a financial intermediary in nine months, but it takes longer to secure a banking licence. It can also be difficult to get licensed in multiple jurisdictions. Regulations, which are evolving constantly, are not always clear either. Regulators are often ignorant of innovations, and overwhelmed with work, which slows down the authorization process. The cost of applying for a banking licence, let alone getting one and reporting over time, can be prohibitive to start-ups. It follows that there is an opportunity for FinTech to help new entrants comply with regulatory requirements more efficiently by outsourcing the work (so-called RegTech).

This could help to overcome the intrinsic hostility of the banks are to new entrants. Incumbent banks fear disintermediation and regulators are understandably influenced by the claims of

“It can be argued that FinTech is committing a strategic error in looking to knock down barriers, speed transactions up, and reduce friction. A slower financial system may be more stable.”

incumbents that new entrants should be as heavily regulated as they are. What, after all, is wrong with a so-called “level playing field”? However, banks do have a contradictory attitude towards new technology as a whole. In their consideration of distributed ledger technologies, for example, they see the immutability of transaction histories as useful. On the other hand, their overall approach to new technologies such as blockchain is protectionist. They seek to lure its potential applications in their industry into talking shops. In general, they prefer to explore how technology can be perverted to raise barriers to entry rather than lower them. Access to payment systems is proving another major barrier to entry. The banks control the automated clearing houses (ACHs) that net payments, while the central banks control the real time gross settlement systems (RTGS) that finalize settlement between banks. It is therefore not surprising that it is those who wish to avoid intermediation by the formal banking system, and do business with counterparties they do not wish to know or be known by, and certainly do not trust, that are using Bitcoin to transfer value. They lack the incentive – not to say the leverage - to drive the wider adoption of a powerful technology that has the potential to make it cheaper for consumers everywhere to transfer value anywhere.

One possible entry point for digital start-ups is to make better use of the data created by social media. It would allow businesses to work out the personalities of individual consumers, and then offer products that match them. This is easier than attempting to determine the risk appetite of consumers, which is inherently volatile. Another potential entry point is welfare payments. The Department for Work and Pensions (DWP) in the United Kingdom, for example, is now looking at the personalisation of transfer payments, with the aim of improving policy outcomes by ensuring the money actually goes to pensioners, the disabled and the unemployed rather than to unscrupulous middlemen.

However, it can be argued that FinTech is committing a strategic error in looking to knock down barriers, speed transactions up, and reduce friction. A slower financial system may be more stable. Indeed, a better objective for FinTech may be to cut the capital devoted to financial speculation and divert it into investment, especially in the developing world, where many of the attractive investment opportunities are situated and the current cost of capital is high. FinTech could help to accomplish this by enabling the creation of new instruments capable of blending risks in ways that lower that overall cost of capital. This will not lower the risk, but it will lower the rates of return required on investments in the developing world.



Presentation: Can artificial Intelligence solve the world's most complex problems?

Kay Firth-Butterfield, Chief Officer & member of the Lucid Ethics Advisory Panel, LUCID AI and Adjunct Professor of Law, University of Texas School of Law

Moderator: Mike Halsall

Venture capitalists are investing heavily in artificial intelligence (AI) projects and applications. But in most countries there is limited understanding in public life of the importance of AI - the signal exception is South Korea, where the government is funding a Korean Won 1 trillion AI acceleration project - despite the fact that so-called "strong AI" is increasingly available, thanks to the exponential increase in computer processing power. A clear instance of this transformation is the victory in 2016 of Deep Mind, a start-up just four years ago, over the world champion at Go.

There is an understandable fear of the applications of strong AI, especially in combination with robotics. This is chiefly because jobs might be lost. But there is also concern that AI might manipulate the way decisions are made, or create losses for which companies using AI are not yet liable at law (such as driverless cars injuring pedestrians or consumers being found guilty of fraud by a computer). These legal issues are untested as yet. In theory, for example, driverless cars will have operator liability, and the operator may then have a contractual claim on the supplier, but such claims have yet to be resolved by the legal system. Regulation is also lagging behind technological developments, of which the use of drones is a classic example. Data privacy and data ownership have also emerged as twin issues that have yet to be decided.

While comparisons with the industrial revolution are not inapt, the scale of the transformation wrought by digital technology will certainly be larger than the steam engine. The nature of the force of digitization is exponential, which means it creates massive impacts quickly. If driverless cars became universal, for example, 300,000 drivers would lose their jobs (though it will take time to build the cars, and thousands of lives would likely be saved through improved road safety). It is not unreasonable to expect AI to change almost everything a lot: not a sector of society or the economy will be unaffected.

"It is not unreasonable to expect AI to change almost everything a lot: not a sector of society or the economy will be unaffected."

Lucid AI is developing a series of inter-operable artificial intelligence software modules (called Cyc) whose designers intend should be able to perform computations based broadly on the cognition of the human brain, as distinct from machine learning artificial intelligence, which uses learning algorithms to make predictions based on available data. The developers of Cyc describe it as a knowledge base of semantic information. Machine learning has so far proved good at pattern recognition (such as recognising different types of cat as cats, recommending books based on past purchases at Amazon, and proposing to supermarket shoppers that they repurchase groceries they have bought in the past). However, machine learning is in effect a "black box," to the extent that the software learns and hence develops its own judgment. As this type of software becomes more powerful, it will increasingly "solve" problems, and make judgments independently from any human input.

The Cyc designers propose to overcome what some people - including Professor Hawking - see as the serious risks of artificial intelligence by adding logical and causal reasoning powers based on percentage likelihoods. To bring human-like reasoning and understanding to a computer requires a command of the links between different domains of knowledge. For example, grasping a simple joke (Does a fly in a glass of wine get drunk?) depends not just on knowledge of biology (flies cannot metabolize alcohol) but the dual meaning of words (flies in a glass of wine get drunk only when they are drunk by a human being).

Once it is complete, Cyc has an obvious application in business. This is to provide a layer of deep knowledge, reasoning power and natural language processing that can sit between databases and data feeds and the API layer by which analysts, CRM devices and KYC testing tools can make use of the information. Cyc is already being used to watch over the behaviour of financial traders for evidence of trading patterns associated with insider dealing. Although this is not new in principle - such systems have existed since the 1990s - the Cyc version learns as it interacts with data, and its experience is enlarged. In some cases Cyc can tell a person (including even a foreign person) what the correct answer to a question is, and why it is the right answer. It can also provide reasoned estimates when it does not know an absolute answer. In each case, Cyc can "discuss" the question with people, helping them better understand the reasoning involved. However, Cyc has not been subjected to a rigorous Turing Test, so it should for now be seen as a work-in-progress. Cyc is based on the work of Doug Lenat, which has resulted in projects for the United States military and intelligence community. The intention of Lucid is to commercialize Cyc. If it is successful in that ambition, Cyc will have a profound impact on the financial industry.



Fourth panel: How can we use technology to eliminate financial exclusion by creating simpler and cheaper money transmission, insurance and savings products?

Robert Hockett, Professor of Law, Cornell

Tim Jones, CEO & Co-Founder, Tibado Limited

Mark Lamb, CEO, Coinfloor

Felix Martin, Author, Money: The Unauthorized Biography

Colin Mayer, Professor of Management Studies, University of Oxford

Moderator: Chris Sier

To its evangelists, Bitcoin has the potential to empower the unbanked. Enthusiasts for Bitcoin also argue that sovereign governments fear Bitcoin and its variants because they enable individual citizens to transfer value, including across borders, without making use of banks or fiat currencies. Their opponents argue that money is a public good and, as such, it will be under-supplied by the private sector, and it is therefore the responsibility of government to ensure an adequate supply.

Bitcoin enthusiasts counter that governments profit from monopoly control of the money supply. They liken the governmental reaction to the royal response to the advent of modern banking in the 16th century, when the rise of commercial bank money threatened to undermine sovereign control of the money supply by enabling merchants to create credits and debits of their own without using the coinage monopolized by kings. The ecu, for example, was closed down by the medieval king of France.

On that view, the result of that contest between commercial interests and royal power was the creation of the monetary system which prevails today: a hybrid of sovereign money and

“Bitcoin threatens to create a form of money which is outside both the central and commercial bank money systems, which may open transfer-of-value services to people excluded from the conventional banking system.”

commercial bank money. Bitcoin threatens to create a form of money which is outside both the central and commercial bank money systems, which may open transfer-of-value services to people excluded from the conventional banking system.

Bitcoin raises another important question for the inhabitants of the digital age: do individual citizens have the right to engage in transactions anonymously? Financial markets have long used anonymity to eliminate discrimination among buyers or sellers (this was the role of brokers) and to encourage trading activity (this is the role of clearing houses) Cash affords everybody the privilege of anonymity – because everybody has confidence in cash and the exchange of cash ensures settlement finality - and, in that sense, Bitcoin does not represent a major technological advance.

However, digital money controlled by regulated banks does not guarantee anonymity in transactions. Today, the basic retail banking products are charge cards, credit cards and debit cards, none of which is anonymous. Unlike cash, where consumers do the work and deliver final settlement directly to each other, all of these cards all require banks to do the work of authenticating transactions and achieving final settlement. There is still no digital equivalent of cash, despite the creation of the stored value card by Mondex in the early 1990s.¹

The adaptation of techniques from outside the formal banking system is one way to enlarge financial inclusion, by making it possible to offer lower cost products. Betting, for example, might prove a useful means for less wealthy people to insure themselves against natural disasters, ill health or loss of income. But so far most of the interest in ending financial exclusion has focused on mobile money.

The transfer of cash into credits that mobile telephone users can transfer through their tele-

¹ A possible exception is the OV-chipkaart (openbaar vervoer chipkaart), contactless smart card used for all public transport in the Netherlands. It can be bought with cash and topped up with cash.

phones is the classic instance of this. In the United Kingdom, MonEase allows people without the documentation necessary to open a bank account - an address, utility bills and a credit history - to gain access to the power to spend. Services of this kind have enlarged financial inclusion, especially in Africa, but they require official backing or at least acquiescence. For example, the central bank in Kenya encouraged the development of Mpesa by not regulating it as a bank product. In India, by contrast, banks have prevented it taking off by insisting the Reserve Bank of India regulate mobile money as a banking service.

Services such as Mpesa are also significant in that they unbundle banking services: payments can be made independently of the banking system. The cash belonging to users is invested not in bank deposits but in government securities, which eliminates the need to regulate the business because it is not engaged directly in maturity transformation (government securities do of course transform maturities) and minimizes credit risk.

This is a reminder that regulation can influence the level of financial inclusion and exclusion. People trying to hold or send or receive money are often excluded because governments or regulators or incumbents deny people access to bank accounts. In Nigeria, for example, where the government wants to inflate away its debts, making it difficult for people to move money out of the country or buy real assets through ready access to bank accounts is essential to the success of the policy.

The beauty of Bitcoin is that it allows users to hold and transfer value without any third party being able to exclude them in this way. Nor is there any need for the State to underpin Bitcoin by defining its use in law. Instead of the law of contract, Bitcoin users are content to rely on lines of code that enable the recipient to open a digital message and extract the value. It is precisely the exclusion of the State from transactions that makes Bitcoin popular in countries whose citizens do not trust their government. Unfortunately, this also makes it extremely likely that governments will take over Bitcoin systems. In fact, once governments accept the payment of taxes in Bitcoin, or Bitcoin equivalents, it will be obvious that Bitcoin has become the equivalent of money.

However, Bitcoin systems do have a further shortcoming as a money substitute, which stems from their deliberate exclusion of deposit-taking. Peer-to-peer lending and crowd funding platforms, and value transfer systems based on distributed ledger technology, do not take deposits either. However a bank is defined - in the United Kingdom it is that it takes deposits, while in Continental Europe, banks are usually defined as manufacturers of credit - the reluctance to accumulate deposits limits the ability of these platforms to manufacture credit through fractional reserving and maturity transformation. It follows that, unless conventional forms of banking survive, absent a major acceleration in the velocity of the remaining money stock, the money supply will collapse.

But lack of access to value transfer systems and credit are not the only forms of financial exclusion. There is a lack of savings products for the financially excluded, as well as a lack of banking products. Those who do save tend to stick to cash, even in their tax-advantaged Individual Savings Accounts (ISAs). Regulation is not helping, because it loads additional costs on to savings products such as mutual funds.

In the longer term, investment will be hampered if long term savings are not accumulated. Alleviating the problem requires a shift in policy towards a higher degree of compulsion. The National Employment Savings Trust (NEST) scheme, which was not compulsory, attracted only 30 per cent of its internally set target audience. Compulsory auto enrolment, on the other hand, is covering 92 per cent of employers.



Fifth panel: How can we use technology to reduce frictional costs in financial markets?

Brian Bartaby, Founder & CEO, Proplend

Michael Laven, CEO, Currency Cloud

Jason Nabi, Head of EMEA, itBit

Peter Randall, COO, SETL

Carlos Silva, Co-Founder, Seedrs

Moderator: Dominic Hobson, COOConnect

Foreign exchange transactions are characterized by high levels of intermediation by investment banks, correspondent banks, automated clearing houses (ACHs), the SWIFT payments co-operative and the bank-owned cross-currency utility CLS Bank. The origins of the high level of intermediation are partly regulatory (for example, a broker-dealer in the United States is not permitted to receive funds directly from abroad), partly risk-reducing (CLS Bank was set up to eliminate Herstatt risk, or the risk of a bank paying before being paid) and partly just operational inefficiencies created by ageing technologies.

This high level of intermediation creates frictional transaction costs. The aim of Currency Cloud

is not to eliminate those costs, but to make them transparent to consumers in the form of an aggregate price to cover all the costs, and so encourage the replacement of the current foreign exchange eco-system by a more efficient infrastructure.

There is resistance from incumbents, of course, because transparency threatens their margins. But in the long term, a more efficient infrastructure will push down prices far enough to support a large number of micro-payments between millions of devices, which the current arrangements, which were devised to support a small number of high value payments, will be unable to support at a viable price.

Seedrs operates in the equity crowd funding market. Although it looks to bring investors and entrepreneurs together directly, the goal of Seedrs is not disintermediation but re-intermediation, with a more efficient model than existing intermediaries. The business of venture capital is high risk – Seedrs estimates only one investment in five makes money for its investors – but the asset class as whole performs well. The apparent contradiction is resolved by the fact that venture capital makes money not by picking winners, but by offering diversification of portfolios into a high performing asset class.

The principal problem which Seedrs addresses is an excessively generous fee structure - most venture capital funds retain a 2 per cent management fee plus a 20 per cent performance fee – that rewards with management fees even the 80 per cent of managers which lose money for their investors. Instead of locking investors into particular investments, Seedrs offers them diversification into the asset class, plus full transparency into the management fees – which is a revelation in an industry historically characterized by high and opaque pricing out of proportion to the returns.

Proplend does disintermediate banks from lending, by linking retail lenders to borrowers directly, and with the additional collateral of a property to secure the loan. Though lenders lack liquidity, they get higher returns than they could achieve in the money markets, plus property as collateral. Retail investors appreciate not only the yield but the elimination of management fees and the greater degree of control over their investments.

Proplend also appeals to institutional investors, which prefer the transparency of lending directly to investing in securitized assets, such as mortgage-backed securities. Lending directly also eliminates the transaction costs imposed by investment bankers, sub-underwriters, surveyors, lawyers and the stock exchanges, which levy listing fees. Proplend effectively offers a fixed interest investment that happens to be secured on real estate.

In the securities industry, there are at least seven layers of intermediation between the investor and the issuer: the fund manager, the broker, stock exchange, the central counterparty clearing house (CCP), the central securities depository (CSD), the custodian, and the sub-custodian. The banks are spending \$150 billion a year on back office processes, and another \$100 billion on post-trade asset servicing. Equity settlements alone, according to Oliver Wyman, cost between \$60 billion and \$80 billion a year, even without taking liquidity and capital charges into account.

Those transaction costs, which are rooted in outmoded technology systems as well as sclerotic processes and procedures, eat into retail savings. The post-trade incumbents currently living off those inefficiencies – by charging customers higher prices to work around them, and profiting from the carry of trapped liquidity - are pondering how to move from the current dispensation to the more efficient future promised by technologies such as blockchain. Publicly, banks say little will change, and have formed a consortium cynics argue is designed to slow change down, but privately they are investing in FinTech firms and partnerships with FinTech

firms to learn about the technology and how it might affect their businesses.

itBit, which has created a private permissioned network called Bankchain, whose nodes consist of regulated financial institutions, aims to help banks make that transition. The firm originated in the purchase of a Bitcoin exchange, but now has a banking licence, and is registered as a custodian, which means it can settle securities transactions in central bank money. The expectation of both itBit and SETL is to reduce transaction costs in the cash payments and securities industries by at least ten-fold.

The markets most at risk of disruption by distributed ledger technologies are cash payments, commodities and precious metals, though the effects could extend to the property markets, especially if the Land Registry adopted blockchain, greatly speeding up the conveyancing process. If every transaction ever made is recorded on the blockchain, even auditors may find their services are much reduced, if not eliminated altogether. In fact, real-time exchanges of assets through distributed ledger technologies might even cut the cost of regulation, by enabling regulators to view transactions directly on the ledger rather than requiring intermediaries to complete detailed submissions about their activities.

However, there is a view that eliminating intermediaries of any kind will destroy tax-paying jobs and so undermine the public finances by reducing the tax base.

A further potential risk is that reducing the degree of friction in financial markets will increase the volume of financial transactions. Given the way that financial transactions are recorded in the national income statistics, the effect will be increased output by the financial services industry. Increased transactional volumes relative to the non-financial economy will raise concerns about the increased “financialization” of the economy.

However, the main reason banks are threatened by distributed ledger technology is that their core function is the maintenance of large numbers of centralized ledgers: who owns what, what they own and when they bought it. Each of those ledgers is not only peculiar to each individual bank but further sub-divided between the various business divisions – cash, equities, fixed income, loans, and so on - within the bank. In effect, every bank and every financial services industry has built up its own ledger structure, which eliminates the possibility of standardization.

The main opportunity offered by blockchain is the standardization of ledger structures. This makes it much easier and cheaper to transfer assets between banks by means of an exchange of software codes. All of the intermediaries engaged in asset transfers and post-trade asset-servicing today are no longer required in a blockchain-enabled world, in much the same way that telecommunications companies no longer needed international operators once telephone interfaces were standardized.

Of course, these same effects could be achieved by non-blockchain technologies. But the flexibility of blockchain – especially the fact it can be permissioned and not just open, which matters in regulated financial markets – is especially well adapted to ensuring good title in asset transfers. Blockchain also offers data enrichment tools that are much more efficient than other technologies currently available, plus reduced transaction costs and savings in liquidity and capital costs for the banks - simply because instantaneous real-time settlement of transactions drastically reduces the size of liquidity pools and the scale of counterparty credit risk. One potential dampener on future growth of these new, technology-enabled businesses is that many FinTech start-ups are thriving in the unusual monetary conditions created by quantitative easing. Once interest rates rise again, many of the currently successful propositions may look less appealing.



Sixth panel: How do we invent new forms of corporate organization and restore old forms (such as partnerships, mutuals and friendly societies) through technology?

Jane Fuller, Co-Director, Centre for Study of Financial Innovation

Alexander Hoare, Partner, C. Hoare & Co.

William Lazonick, University of Massachusetts Lowell

Saule Omarova, Professor of Law, Cornell

Moderator: Donald Lawrence, Senior Research Fellow, UCL

C. Hoare & Co., which currently has 10,000 customers and £2 billion in assets under management, is an advertisement for the virtues of unlimited liability. It was established as an unlimited partnership in 1672 - nearly 200 years before limited liability legislation was first passed in the United Kingdom - and has remained one ever since. This fosters an intense focus on risk, as opposed to profitability. The long history of the firm reinforces this by turning perpetuation into the *raison d'être* of the bank.

Although Hoare's appreciates the value of digital technology - it spends an average of £100 million on technology every five years - it attaches a higher priority to caring for customers. The principal anxiety of the management today is cyber-crime. It is difficult to create change in a small organisation let alone a large one. Every day the management takes decisions which accord with the established values of the partnership. However, nine times out of ten the organisational antibodies inside larger banks defeat innovative ideas. If big banks could deliver economies of scale and scope, banks like Hoare's would not exist.

Banks have certainly proved themselves to be poor at cutting costs. They also manufacture complicated products that make it hard for customers to know how financial products work, or what represents a good outcome. It is worth remembering that FinTech start-ups offering simpler and cheaper products have so far led a charmed life. They have not been tested in difficult markets in which customers lose money. There remains a risk that financial innovation will be derailed by investor losses.

Where banks have made progress in changing their business model is remuneration. Bonuses are down by a third, are paid mainly in company stock, and have to be retained for long enough to ensure the profits they reflect are sustainable. If not, they are subject to clawback. These measures have had more success in inflating fixed costs (as higher salaries are used to compensate for smaller and slower bonuses) than reducing short-termism in the banking industry and, in terms of disclosure, ensuring that banking is now more transparent on pay than other industries.

However, greater transparency has not led to a fall in relative remuneration. In banking, average annual compensation still stands at £250,000 despite a 25-30 per cent fall since the financial crisis. In fund management, there has been no decline at all. In the financial services industry, there is a belief that the adjustments to compensation are merely a blip, and not a secular change.

One explanation for the lack of decisive change in remuneration is the supine behaviour of shareholders, who make no use of the increased disclosure. It is not obvious that start-ups backed by crowd funders will be any better at solving this principal-agent problem. Neither co-operatives nor mutuals before them have succeeded any better than public joint stock companies in solving the agent-principal problem. A simple solution shareholders should consider adopting to solve it is a switch away from incentive-based pay towards fixed salaries, with the goal of turning eat-what-you-kill hunters into hierarchy-minded professionals that always act in the best interests of their clients: the shareholders.

There is of course a view that a company owes duties to stakeholders other than its shareholders. On this view, the management is not purely the agent of the shareholders, but has obligations to customers, employees, suppliers and even the wider society in which it operates. Those who cleave to this view hold that the "client" of the management is the company, and not any particular stakeholder within the bundle of contracts that make up the company. Management nevertheless remains problematic. Despite the changes that have occurred since the crisis, the links between pay and performance, and between performance pay and shareholder value, remain tenuous. Technology could help in fashioning tighter links, by enabling banks and other large companies to collect and share more and better data on what and how employees are paid, and then linking it to sounder measures of performance. At present, the remuneration structures in financial markets are like the pay of professional footballers before data was collected on goals scored, assists, and distance run in the course of a match.

Whether or not the mismatch can be traced to an agent-principal problem, a major difficulty in resolving the issue is a theoretical shortcoming in economics. Mainstream economists work with an unconvincing theory of the firm, which gives them no useful information or insights into how business enterprises actually work. The present corporate structure rewards value extraction, not value creation. This is one of the side-effects of the Friedmanite emphasis on the maximization of shareholder value, at the expense of strategy and innovation.

The primacy of shareholder value is sometimes described as the most damaging economic

theory in history of humankind. It has reduced public companies to spending 100 per cent of their net income on dividends and share buy-backs rather than reinvestment. The maximization of shareholder value also explains why wealth is concentrated in fewer and fewer hands, and why middle class jobs are disappearing as the search for increases in shareholder value prompts repeated cuts in payroll.

This is destroying the ability of the corporate sector to create value. One reason stock analysts have failed to notice this is that they too suffer from the lack of a proper theory of the firm.

When company executives or fund managers say they need a higher dividend, or a share buyback, or a merger or acquisition, their argument is accepted uncritically. Classic instances of this are Carl Icahn buying Apple shares and demanding money to raise the stock price - demands which Apple has agreed to meet.

It is hard to argue that shareholders such as Carl Icahn are creating value: they have merely bought shares with a view to extracting value created by others. Corporate raiders extract value in other ways. A pharmaceutical company has bought the patents to an innovative hepatitis treatment, created largely by publicly funded research, that is now generating revenues of \$34 billion for the company. Although the treatment was created by public funds, the price is fixed at \$84,000 per patient for 12 months, denying other potential users the benefit. In effect, the company is minting cash but killing people. But it allows the CEO to collect \$19 million in pay, performance pay and stock options and as much as \$190 million in taxable income.

In other words, the gains from publicly funded value creation are being privatized by a system in which company executives are highly incentivized to maximize the share price and pay generous dividends. They are even prepared to move the company headquarters to jurisdictions where the company can pay lower taxes, further insulting the public funding many companies receive. In the United States, stock buy-backs and dividends have since 2011 been five times what companies paid in taxes. To maintain that record, they need to get the stock price up by paying out profits. The only way to stop this process, which is driven by executives as prime beneficiaries, is to introduce new forms of ownership. These could include state ownership and 100 per cent employee-owned businesses (though these structures might not suit other stakeholders).

In banking in particular, the case for breaking up the major banking groups into smaller entities is powerful: no institution in a market economy should be Too Big to Fail, and regulation has so far proved ineffective in preventing large financial groups from extracting value from the economy. The arguments in favour of large financial conglomerates - that they cut transaction costs through economies of scale and scope, are necessary to service equally large multinational companies, and provide consumers with a convenient one stop shop - are flawed.

They are flawed because banks grew and thrived through access to cheaper funding as a result of the implicit guarantee that they will always be rescued by taxpayers. This has enabled them to subsidize more profitable trading activities with cheaper capital and financing. Large banks can also take risk on to their balance sheets because of public funding.

The only way to eliminate the unfair advantage conferred on large banks is to break them up into specialist banks that can then be allowed to fail without damaging the wider economy.

This is unlikely to happen without direct government intervention. In a sense, the corporate clients of the major financial conglomerates are the creatures of the major financial conglomerates: they exist to consume the products manufactured by the major financial conglomerates. They are, in effect, addicted to financially-driven corporate mergers and acquisitions and financially complex instruments.



Presentation: Data Science: Challenges and Opportunities for the Future of Finance

Patrick J. Wolfe, Deputy Director, Alan Turing Institute

The National Institute for Data Science (NIDS) is a government-funded body, originally conceived by Sir Mark Walport, the government chief scientist, whose purpose is to combine people and algorithms with hardware to exploit opportunities in data science. It is intended to be more flexible than a traditional research laboratory, in that its members will focus not on pure research but on practical outcomes.

The NIDS, which opened in November 2015, has an operating budget of £15 million. It is expected to employ 150 people by October 2016, on a site adjacent to the British Library, and to hire more experts over the next four years. It is drawing initially on the work and staff of five universities - Cambridge, Edinburgh, Oxford, UCL and Warwick - and has a partnership in place with Intel.

The NIDS will start with 125 senior academics, who will appoint junior research staff and PhD students. The areas of research include data security, smart cities, health and well-being, the Internet of Things, and financial services. An important part of the mandate of the NIDS is to train data scientists.

The vision of data science of the founders of NIDS is to blend fields which have hitherto remained separate. It will operate at the intersection of mathematics and computation, where traditional university departments are too siloed to deliver. The output will include mathematical representations of data (geometry and topology), machine learning, and the gathering,

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The founders of the NIDS believe there is a leadership vacuum in the emergent field, which they want to fill. They expect to form further alliances with commercial companies to “ventilate” ideas across different disciplines and opportunities.

Financial services are an early area of interest. The government has already published a report on the use of distributed ledger technology in the public services, which included proposed uses in the financial markets. The Bank of England has expressed interest in research on the application of digital wallets.

Other potential opportunities include exploration of how financial networks work, in terms of flows, and the systemic risk this creates; risk and compliance, especially in insurance (where climate change, for example, might be altering the nature of the risks being underwritten); algorithmic trading, and especially the use of machine learning; retail banking, in the sense of using data about customers to better manage counterparty risks and manufacture more appropriate products; digital and crypto-currencies, where there is strong interest within the government and at the Bank of England in their possible impact on monetary policy and conditions; distributed ledger technology; and smart contracts, which have applications outside finance, including health and law.



Seventh panel: How do we use technology to extract and summarize knowledge from the data trapped in financial market prices, media, social media and corporate and regulatory documents?

Emmanuel Haven, School of Management, University of Leicester

Chris Miller, Founder and CTO, Percentile

Anna Pajor, Head of Capital Markets Intelligence, GreySpark Partners

Lisa Schutz, Managing Director, InFact Decisions

Moderator: Elizabeth Lumley, Director, Global Ecosystem Development, Startupbootcamp FinTech & InsurTech

Financial services firms tend to be possessive about the data they hold. This is mainly because information confers a competitive advantage in financial markets, and firms do not want their competitors exploiting their data or using it to trade against their positions. A secondary problem is privacy. Banks generally commit to keep client data confidential, and it is not always clear that they own the data created by transactions with their clients.

Finally, banks certainly do not own the data they purchase from third party vendors - such as stock market prices - even though their activities often create it. It is harder to develop new products and services when the data belongs to someone else, though not impossible. It is well understood that large and successful technology businesses (such as Amazon, Facebook and Google) monetize data created by their users, and that smaller companies are following their lead. There is a school of thought that they should pay users for creating data, and this is becoming an object of study in economics as well as technological circles. Markets are seen to be failing in the area of data, but a clear path to resolving the issue is not yet apparent.

“Information confers a competitive advantage in financial markets, and firms do not want their competitors exploiting their data or using it to trade against their positions. Banks generally commit to keep client data confidential, and it is not always clear that they own the data created by transactions with their clients.

In the meantime, demands from consumers (to deal with their banks and wealth managers on-line and in real-time) and regulators (to obtain data for improving their assessments of systemic risk) are forcing banks to create single data platforms. A difficulty they face is that much of the data is inaccessible. It is either trapped in legacy systems, or in internal silos that cut fixed income off from equities, and both from foreign exchange. The same is true of retail banking systems, where banks struggle to obtain a single or common view of the assets and liabilities and transactional activities of their customers.

Regulatory reporting, while increasing the volume of data captured from financial services firms, has not improved the situation. The regulatory reporting formats used in North America and Europe are not standardized, and so cannot be aggregated easily. Obtaining a holistic view of the risks incurred by the entire firm, for example, is made extremely difficult not because the technology is inadequate, but because of lack of standardization of data and obstructive internal politics and culture.

One hopeful sign is that consumers are comfortable with their data being used by banks, provided they get a benefit from it, in the shape of improved products and services. Those services might include reports on spending patterns, financial diaries that can recall past transactions, automating the submission of personal accounts or tax returns, counterparty credit risk assessments, fraud detection, and the prevention of cyber-attacks. However, the industry has yet to comb through the Big Data sets collected by banks to identify robust statistical findings of immediate practical value, such as what the spending patterns of individuals say about their creditworthiness.



Eighth panel: How can new technologies such as blockchain drive innovation in financial services?

Dave Birch, Director of Innovation, Consult Hyperion

Clara Durodié, Independent Director, TeraVault Technology Investment Fund

Colin Kwan, CEO, Magnr

Vili Lehdonvirta, Oxford Internet Institute

Hakim Mamoni, Chief Technology Officer/Co-Founder, Coinsilium

Svi Rosov, Analyst, Capital Markets Policy, CFA Institute

Moderator: David Wood, Chair, London Futurists

It is easy to caricature blockchain either as a technology useful only to the criminal classes, or as one so rich in unrealisable promises that it warps the thinking of otherwise intelligent people. In reality, there are excellent use-cases for blockchain technologies in financial services. The Bank of England, for example, has already proposed that a digital currency run on blockchain technology would make it easier to impose a negative rate of interest. The innovations delivered by blockchain will by their nature be unexpected, but they will almost certainly be characterised by vastly increased transparency.

Blockchain is best understood as a new kind of computer - the “consensus” computer - capable of erasing traditional forms of accounting and record-keeping and fostering an unprecedented degree of transparency. This transparency will have an impact on the way markets are created and work. Sub-prime mortgages bound to default, for example, could not be hidden in a blockchain network, because the underlying individual mortgages can be seen more easily in a distributed ledger than they can in the centralised ledgers of the banks. To take another example, blockchain technologies could make it possible to buy and sell closed-ended funds intra-day, through real-time net asset valuations and instantaneous settlement.

This enhancement of transparency is in tune with the spirit of the age in the aftermath of the financial crisis, which is widely thought to have originated in opacity as well complexity. Banks,

which are under intense pressure to increase transparency, would find blockchain technologies helpful. This is because it would enable them to overcome their natural resistance to greater transparency by allowing them to retain anonymity via so-called “conditional pseudonyms.”

More importantly, as Lawrence Lessig has pointed out, software code such as that used by Blockchain represents a new form of commercial law. One interesting implication of this is to put an end to financial services firms paying developers to translate their compliance with laws and regulations into proprietary software code. Instead, laws and regulations could be distributed in coded form at the outset so once the code is installed on the in-house systems, the firm would automatically be compliant. This would release vast quantities of time and money presently tied up in automating compliance.

The counter-argument is that the savings likely to accrue from the application of blockchain technologies are exaggerated, because the inefficiencies in data capture, storage, processing and reporting are not technological but human. Securities settlement operations in Europe, for example, work to a timetable of trade date plus two days (T+2) even though existing technologies, such as the TARGET2-Securities (T2S) settlement platform built by the European Central Bank (ECB), can already settle transactions on T+0.

Another challenge innovations that make use of blockchain technologies must overcome before they can be applied to conventional markets is governance. Bitcoin, the original application of blockchain technologies, offered perfect enforcement of rules without reliance on any third party. In trustless environments such as Bitcoin, discipline is enforced by the miners. Non-Bitcoin applications of blockchain technologies, in the conventional payments or securities markets, require rule-setting, standardization and “permissioned” access to the network to avoid subversion by bad actors or rent extractors.

A final obstacle to widespread adoption of blockchain technologies, say some critics, is that they solve no problems for western consumers that cannot be solved by existing technologies. Others disagree. They say, for example, that blockchain can widen financial inclusion, especially in less developed markets where consumers lack access to the banking system. Other ideas include using blockchain technologies to shift data from silos on to integrated platforms; creating trustless, non-collusive networks; and especially eliminating the heavy costs of reconciliation in every industry, by giving all parties to every transaction access to a distributed ledger that no one can alter.

The advocates of blockchain technologies add that regulators are enthusiastic about them not only because they can enhance transparency, but because they can (ironically, given official fear of crypto-currencies) make fraud and illicit financing easier to detect. More importantly, blockchain technologies can make financial markets more efficient by reducing transaction costs.

By structuring data automatically, blockchain also makes it easier to audit firms (auditors would not need to look at any records other than the distributed ledger to see every transaction a firm has undertaken) and manage systemic risk (the data is gathered in the course of its creation, making it readily available for analysis close to real-time).

Among the most obvious applications of blockchain technologies is the clearing and settlement of financial transactions. Here, the main obstacle is the sunk cost of the existing infrastructures. Being 5-10 per cent more efficient is not enough: the savings need to be compelling. Provenance is another issue if new asset classes are being created, though this can be overcome by established technologies such as digital fingerprinting.



Presentation: How to regulate finance in the digital age

Jürg Müller, Economics Editor, Neue Zürcher Zeitung

Müller spoke about *The End of Banking*, which he co-authored under the pseudonym Jonathan Macmillan.

The promise of FinTech is lavish. It could increase transparency, cut out intermediaries, and increase the diversification of risk. But promises of this kind are nothing new. All of these goals are achievable using the technology of ten years ago. The problem of a decade ago is that technology was used mostly to create complex financial instruments such as Mortgage Backed Securities (MBS) and Collateralised Debt Obligations (CDOs). Financial networks became extremely complicated.

Today, FinTech is on a more constructive path. Peer to peer (P2P) lending, for example, is designed to find the shortest path from lenders to borrowers, rather than the most circuitous, with different levels of counterparty risk packaged and sold separately. P2P lending, armed with the processing power and data analysis of FinTech, also offers superior diversification of counterparty risk, better assessments of creditworthiness and secondary markets in which these risks can be traded.

Unfortunately, conventional banks are continuing to participate in the evolving marketplace as both lenders and borrowers. Banks are, in effect, re-intermediating themselves in the face of the threat from P2P networks. Unless the banking system is thoroughly reformed, this process of re-intermediation will end badly. Already, leveraged non-bank entities rooted in the conventional banking system, such as hedge funds, are being drawn into the P2P lending markets.

In this environment, the most useful service which FinTech can render is to revolutionise the banking system. The substantive role of banks is to transform the risk, liquidity and notional size of assets, in order to marry lenders and borrowers. The price of banks fulfilling this function is liquidity risk, which is what leads to bank runs. Governments introduced central bank lending and deposit insurance to contain the consequent bank panics, but the downside is that these measures create a moral hazard which encourages excessive risk-taking.

This in turn prompted regulators to impose increasingly heavy capital requirements on banks via the Basel I capital adequacy regime. These worked when technology in banking was still

“Ever greater regulation, and ever-more demanding capital ratios, is clearly not working.”

relatively primitive, and paper ledgers were used. Now banking is an entirely digital business, and banks can slice assets up into different risks, and shift them off their balance sheets via securitisation. This has enabled banks to bypass capital ratios. Aware of this, regulators intensified capital ratios and insisted banks make use of internal risk models (Basel II). Once these were proved ineffective in the financial crisis, regulators tried once again to tighten capital ratios (Basel III).

Ever greater regulation, and ever-more demanding capital ratios, is clearly not working.

The “Austrian” option, of 100 per cent cash reserving, is no longer viable because it is now clear that governments will always bail out banks. An entirely new approach to regulation is required, based on the fact that banking is a digital business. Precisely because it is a digital business, the systemic risk posed by banks can be tackled at the accounting level.

It is at that level that banks can be prevented from taking risks with other people’s money by applying a new accounting rule that stipulates that the total value of the real assets of a company must always be greater than or equal to value of the company’s liabilities (the “systemic solvency” rule).

This solution draws on the established accounting idea of technical solvency, so it is not a radical intellectual departure. It is also much simpler to administer than the 660 pages of Basel III.

An obvious objection to the proposed rule is that, if banks are prevented from taking risks with other people’s money, other companies will create banking products and services to replace them. This problem can be countered by applying the systemic solvency rule to every limited liability company. This will not constrain non-financial companies because they tend to operate with much higher levels of equity than banks. Many - though not all - of the P2P platforms now emerging are more like mutual funds than banks: they do not use leverage or look to finance assets off the balance sheet. Only those platforms which have borrowed money represent systemic risk.

The main challenge in moving from the present system to one in which the systemic solvency rule applies is to devise a transition in which the money supply does not collapse, as credit is reduced, sparking a deflationary spiral. One answer is to let central bank balance sheets inflate. Quantitative easing (QE) is effectively shifting developed economies away from a mixture of central and commercial bank money towards central bank money only. Making the transition from the present system is the subject of a forthcoming book by the same authors.



Ninth panel: How can we use technology to regulate markets in ways that work effectively at much lower cost?

Stephen Markscheid, Partner, Wilton Partners

Henry Raschen, Head of Regulatory & Industry Affairs Europe, HSBC Securities Services

Robert Sams, CEO and Co-Founder, Clearmatics, London

Alan Shipman, Lecturer in Economics, Open University

Moderator: Simon Carne, Proprietor, Simon Carne – Business Consulting

Regulation of financial markets and institutions is a self-fulfilling prophecy, in the sense that the moral hazard built into the banking system in particular leads to excessive risk-taking. Regulation then tries to obviate the excesses, usually after the fact, and without addressing their structural origins.

Technology has an obvious role to play in making regulation more effective. It can be used to increase transparency and eliminate silos between and within financial institutions, allowing data to be aggregated and analyzed. Technology can also make it easier for financial institutions to retrieve and deliver data to regulators.

By helping regulators obtain data in a timely fashion, and understand what it says, technology can also improve the quality of regulatory surveillance. Technology could turn regulators into robo regulators, which draw on a much wider range of data from bank statements, social media, shopping statistics, house prices and other sources of information about consumer behaviour. By using public and private sources of Big Data, and machine learning, regulators could gain additional information about the current state of the markets and even adjust financial conditions in real-time.

Banks, on the other hand, have to balance the demands of regulators against those of customers and shareholders. Technology can help them achieve and maintain that balance by automating data collection for regulatory reporting, but investment in compliance technology has to compete with investment in technology to support new products and services. Technology is also increasing competition in the banking industry, and driving down margins, further reducing the budgets available for investment in innovation.

This technological competition is forcing banks to do more dangerous things in order to maintain profitability. Since the story of financial regulation is one of increasing complexity, as regulators try to keep up with bankers, this trend is not an encouraging one. The Basel I capital adequacy regime was described in a 30 page document. Basel II required 347 pages.

while regulation is decreasing credit risk, it is actually increasing the exposure of banks to operational risk. If banks are expected to make investors whole when any operational risk materialises - the classic instance is a missed deadline for a corporate action - no amount of technology can substitute for a balance sheet adequate to the scale of the risks being run.

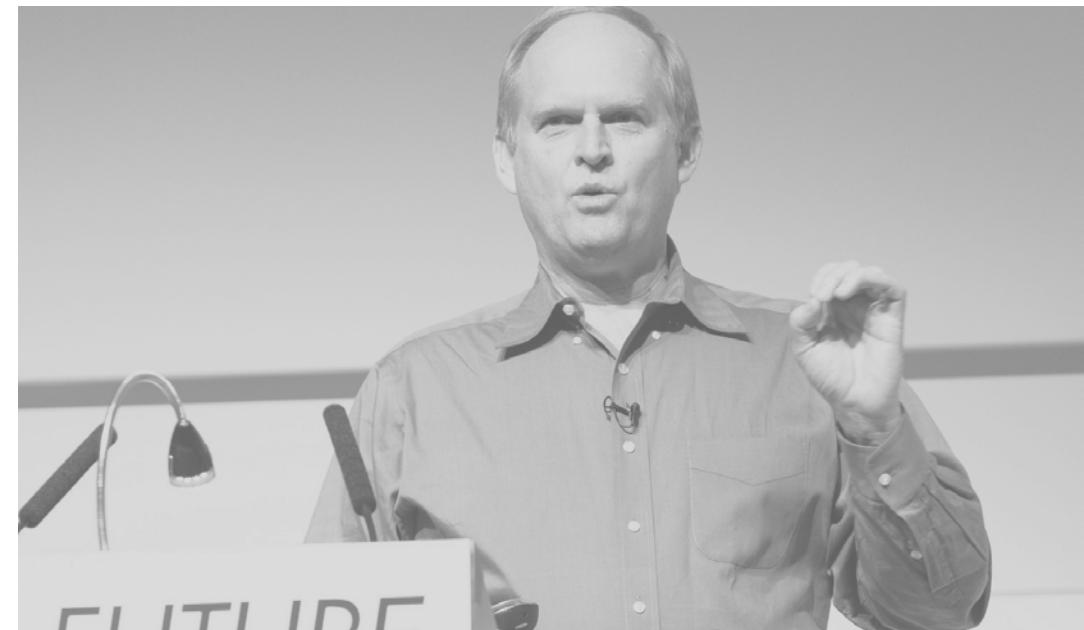
Basel III took 660 pages.

With the complexity of rules expanding at that rate, it is as difficult for banks to keep up with regulators as it is for regulators to keep up with banks. It is absurd that regulation has become so complicated that some financial firms have had to outsource the work (without shedding the liability for non-compliance). Even large institutions are struggling. At the moment, for example, just ten of 31 globally systemically important financial institutions (G-SIFIs) are compliant with the Basel principles on data aggregation, though these were published as long ago as January 2013.

Simpler regulations would actually work better, as the Glass Steagall Act did for 60 years. It would also be sensible to abandon the search for global uniformity, and allow greater national variations in regulation, because some markets in some countries are better placed to absorb risk than others. However, even a system based on simple rules is difficult for banks to follow when financial markets are as complex and dynamic as they are today.

Regulation is in fact now so complex that it is at risk of contradicting itself. Much of current regulation - notably capital and leverage ratios, but by extension the reporting of swap positions to trade information warehouses - aims to reduce the ability of banks to advance credit. At the same time, banks are being forced to take responsibility for losses incurred by investors, notably in their expanded role as depositaries under the fifth iteration of the Undertakings for Collective Investment in Transferable Securities Directive (UCITS V) and the Alternative Investment Fund Managers Directive (AIFMD) in Europe. This means that, while regulation is decreasing credit risk, it is actually increasing the exposure of banks to operational risk.

If banks are expected to make investors whole when any operational risk materialises - the classic instance is a missed deadline for a corporate action - no amount of technology can substitute for a balance sheet adequate to the scale of the risks being run. Though the processing of a corporate action can be automated, corporate financiers keep coming up with more complicated ideas that increase the risk of operational errors being made.



Presentation: The Age of Em

Robin Hanson, Author

In his recently published book, *The Age of Em* (Oxford University Press, 2016), Robin Hanson uses our current understanding of physics and economics to make predictions about the state of humanity, and its societies and economies.

Economic growth rates have accelerated throughout history. At present, economies double in size every 15 years. By extrapolating the historical growth trend, it is not implausible or historically unusual that economies could double in size every week or month.

Nor is it improbable that computers at least as intelligent as human beings will soon be readily available. They will take the form of emulations of the human brain, based on scanning of human brains to build models of individual brain cells.

If the brain scan is good enough, the model ought in principle to be the same as the original brain that was scanned. If so, the emulations can be substituted for human beings. Since they can be copied at zero marginal cost, they will be cheaper than human beings.

Hanson calls the advent of this technological innovation the Age of Em. A relatively conservative prognosis suggests the Age of Em could be dominated by robots encapsulated in computer files. This would have the following consequences:

- The computer files would be immortal, since they can copy themselves;
- The computer files could travel at near-zero cost, since they can travel electronically;
- A single computer file could take over an entire labour market, by making copies of itself;

- Wage levels will fall close to zero, since computer files can be copied;
- Economic growth rates will increase, because economies are not constrained by the difficulty and expense of reproducing human beings;
- Interstellar space travel will become possible because computer files can travel at the speed of light;
- Economies will be growing fast enough for human beings to retire after two years and live off their savings, whose value will double every two years;
- Ems will copy the most desirable characteristics of human beings, leading to demand for the brain of Olympic athletes, Nobel prize winners, billionaires, Pulitzer and Oscar prize winners and - more pathetically - clever and hard-working people in general;
- Ems will enjoy the paradox of living lives of idle luxury while also working all the time, because only one copy will be working at any one time while all the other copies enjoy a life of leisure;
- More copies will be made of computer files that are in high demand (for example, to engineer something useful) and less copies of files that are in low demand (for example, ones needed to visit your mother);
- Ems will become obsolescent, in the same way as human beings, but they will be able to choose to forget death (and being comfortable with that idea ensures that they will survive);
- Politically, leaders will communicate directly with the led by making copies of themselves that can talk directly to all other Ems or just some of them, if there is a secret to be shared;
- Training Ems will be cheap because only one needs to be trained, and it can then make copies of itself;
- The cost of retirement can be made cheaper if an Em chooses to run slowly and more expensive if an Em chooses to run fast;
- The plausible range of speeds at which an Em can run will range from paying a billion times less to run slow and a billion times more to run fast, with Ems running at the same speeds congregating into the various layers of a class hierarchy, in which slow Ems are intrinsically less valuable;
- Ems will solve over-crowding in cities, reduce drastically the costs of building, running, maintaining and growing cities, and end crime and

congestion, because they can live in large numbers in small spaces and interact virtually rather than physically, allowing vast numbers to live contentedly in dense and highly concentrated environments;

- Problems of marriage and family life will be solved producing more male or female Ems on demand;
- Poor or persistent marital mismatches can be overcome by creating an over-supply of fast-running Ems and an under-supply of slow-running Ems;
- Ems can never be slaves, because labour will always be sufficiently cheap and plentiful to avoid the need for it; and
- Ems will not run into an energy constraint until the entire planet Earth is overrun by Ems, because the costs of computing will continue to fall and Ems occupy minimal space.

This, says Robin Hanson, is a plausible world that could come into being soon.

Financial Inclusion Challenge

Facilitator: Mike Halsall, Chairman, slowVoice

Alpesh Doshi of Fintricity asked whether the unbanked of the developing countries can become part of the world economy in general and the global financial system in particular. If they can, the potential gains are enormous. There are two and a half billion people without a bank account, of which more than three out of four live on less than \$2 a day. In sub-Saharan Africa only 25 per cent of adults have a bank account. If those currently excluded from access to finance can be joined to the global financial system, it could raise the standard of living of the poorest people in the world. Insurance, for example, increases agricultural productivity by 25 per cent. Fintricity, which is working with a mobile phone company, offers a bank account on a card. Biometrics are used to identify and verify individuals, skipping the need for elaborate Know Your Client (KYC) tests in parts of the world where identity where even births are not properly recorded. With the card, a farmer can make and receive electronic payments, eliminating the security risks and payment limitations of cash, and the transaction costs of middlemen, and allowing them to insure their output. The card also enables farmers to offer the land they own as security for a loan. It provides a convenient and direct means of receiving charitable donations and remittances from abroad. The card also creates the possibility of drawing up ledgers to record not only assets and liabilities, but also the ownership of assets.

Gabriela Isas of Score spoke of her personal experience of unmanageable student debt. She said the average graduate leaves university with £30,000 of debt, and a limited understanding of the implications of entering the labour and financial markets under such a burden. The purpose of Score is to educate students about financial matters. A proof of concept study endorsed a “game-ified” app that can help young people understand credit terms, annual percentage rate (APR) calculations and other technical terms, so that millennials can grasp the consequences of their spending and borrowing decisions. The app can also be used to credit-score millennials, with the goal of educating graduates about risks of borrowing. The app works by aggregating data from banks, and Score is working with banks to create APIs that make this data sharing possible even before the second iteration of the Payment Services Directive (PSD II) makes it mandatory. Users of the app will be recruited by partnerships with universities, Mumsnet, and the Student Loans Company. The revenue model is for Score to be paid by the banks and insurers for lead generation. The suggestion that this creates a conflict of interest is misplaced because Score is an independent platform that will always recommend the financial product that best suits the individual.

Ralph Hazell proposed the reinvention of barter at the local level, using crypto-currencies and distributed ledger technologies. He argued that the use of fiat currencies undermines social cohesion by eliminating personal reliance on counterparties to deliver on their promises. He pointed out that digital platforms exist already to share, say, office space and tools, and that the concept can be extended to services as well as assets. The problems that need to be overcome are to identify the issuer, and their counterparty, and to work out how to tax their transactions. The answer, according to Robert Hazell, is for people at the local level to barter with each other using a crypto-currency to measure the value being exchanged, operated on distributed ledger technology. He admits that previous attempts to start barter currencies –

which sound like a contradiction in terms - have failed, so the concept will struggle to progress without a successful working example that will make it easier to build scale at the local level. Robert Hazell disputed that scale will always be constrained by the traditional problems of barter - namely, the need for the double coincidence of wants between the parties to the transaction, and the difficulty of dividing goods and services up into exchanges of equal value - on grounds that the proposed system seeks not global or even national or regional scale, but the right scale, which he believes is at the local level. In other words, people are more likely to exchange skills at the local level, creating a community trading system that adds to the social cohesion of that community.

Lawrie Chandler of Edale Ethical Investments designs financial products for religious minorities, whose members wish to invest ethically, with Sharia-compliant products being the largest growth market. At present, the firm offers two regulated funds, which are sold in the United Kingdom and France to investors prepared to pay from €75 a month or to invest a lump sum. They are distributed through the familiar fund distribution channels in both countries: namely, banks, private banks, wealth managers and Independent Financial Advisers (IFAs). This means that the firm charges a single management fee in the United Kingdom, where the Retail Distribution Review (RDR) has obviated the use of commissions to incentivize sales, but continues to pay retrocessions to fund distributors in France. The company now wishes to attract funding to accelerate its growth.

Thongchai Wirojsakesjeree, a student at University College London (UCL), wants to create a means of giving holders of cash a higher yield than they can obtain at the bank. His solution is to reinvent fractional reserve banking without banks, complete with maturity mismatches: a pool of cash available for immediate withdrawal, with the balance invested in higher yielding but less liquid instruments. Insurance will be used to cover the risk of default. Operating without branches will cut overheads, allowing the yield to be enhanced further. A distributed ledger technology will be used to record transactions.

Robert Kay of Govcoin pointed out that financial inclusion implies access to credit. To access credit, an individual needs a credit score, and to calculate a credit score a lender needs access to information about potential borrowers. Govcoin provides the unbanked with a basic digital identity, and uses a permissioned distributed ledger technology to execute payments using mobile telephones. The payments are as a result cheaper and faster - they do not have to bear the heavy overheads of the retail banks, and nor are they reliant on the out-of-date technology of the banks - and include much richer transaction data. The system can also support conditional payments. Govcoin is working with the Department of Work and Pensions (DWP) to use the technology to distribute welfare payments to the unbanked, backed by an energy utility (Npower), academics at University College London (UCL) and a major retail bank. 90 per cent of DWP clients have mobile phones, which is a higher level of penetration than that achieved by bank accounts. Govcoin has the ambition to extend its service to Canada and the United States.

Niall Haughey of Outgro pointed to the mismatch between the demand to borrow and the supply of loans in developing world markets. There is an estimated 500 million smallholder farmers supporting two billion people. Their demand to borrow is \$450 billion, while the supply

“Govcoin provides the unbanked with a basic digital identity, and uses a permissioned distributed ledger technology to execute payments using mobile telephones. The payments are as a result cheaper and faster - they do not have to bear the heavy overheads of the retail banks, and nor are they reliant on the out-of-date technology of the banks - and include much richer transaction data.”

of loans is only \$9 billion. Outgro is a digital database of smallholder farmers, allowing credit-relevant data to be analyzed and transferred, though it does not yet include a register of assets. The data will be used to credit-score the smallholders, and to distribute loans, though it could also be sold to micro-finance providers. The business is currently running a pilot project in northern Malawi, where Outgro has now gathered data from 2,000 out of 4,000 smallholders in the area. The data is collected by “lead farmers” using an app supplied by the company, which checks the whereabouts of the lead farmers by satellite tracking, chiefly to combat fraud. Of the 2,000 farmers for which Outgro has gathered data, 11.6 per cent have a bank account, and 6 per cent have made use of mobile finance. Outgro has formed a partnership with an agri-business, in order to ensure farmers get good advice, and adopt good practices if they are lent money.

Niall Bellabarba has created a robo adviser called The Oak, which is described as “the smart financial assistant.” It is based on the assumption that people need help with personal finances, because they lack the time, the ability and the data to do it themselves. The lack of retail savings, coupled with the high cost of credit, are the clearest symptoms of these information asymmetries. The Oak aims to use technology to deliver high quality advice on banking - as opposed to investment - to people earning between £20,000 and £50,000 a year. It is

an artificially intelligent assistant that understands the finances of the individual, recommends savings products, provides tools to calculate the affordability of products, and works out if existing products are a good deal. The business model is “freemium,” with premium products only being chargeable, while scale is built. The goal is to partner with independent robo advisers such as Nutmeg. Approaching product providers via wholesale distributors enables The Oak to obtain discount pricing, and avoid the administrative cost and complexity of entering into individual retail agreements. The firm is using Yodelly to acquire the transaction histories of its customers, which ensures the users stay in control of their own data. The Oak is using the same information sources as Mint, the online money manager that gathers data about individuals to create budgets. The passage of the new version of the Payment Services Directive (PSD II), which obliges banks to share details of their customers with third party advisers at the request of the customer, will help The Oak to gather the data needed to offer services to customers.

Chris Holloman of Divido Financial Services explained that foreigners entering the United Kingdom lack access to the financial services industry, because it is difficult to open a bank account without documentation of a kind which it is impossible for newcomers to obtain. Without a bank account, a foreign arrival cannot gain access to credit either. Divido aims to solve this problem by linking up retailers and lenders, in which retailers offer lending propositions which banks can compete to fulfil. Divido loans are unsecured, with credit checks effectively performed by retailers. The goods being purchased are not used as collateral, but tend to be high value and high margin products. The success of the concept hinges on being able to offer the banks a high volume of loans. Divido has raised £1 million in financing from a group of backers led by WorldPay.

Daniel Bruno proposed what he calls the Solidus bond. This is a digital currency bond designed to lower barriers to entry to the term credit markets. Investors purchase bearer bonds from borrowers at maturities of between 30 days and 10 years, which pay coupons down to three decimal places every 30 days. The direct relationship between the purchaser and the borrower eliminates the need for brokers, enabling Solidus to offer lower costs to borrowers and higher yields to investors. Owners of the bonds can transfer them to any other user of the system, so the Solidus bond offers liquidity as well.

Gabriela Isas of Score, Niall Haughey of Outgro and Thongchai Wirojsakseree, a student at UCL, were shortlisted. They were invited to attend a workshop event in London in June 2016, ahead of a final selection event in July 2016 where the winner will be announced. Prizes include a place on Singularity University’s Executive Programme at NASA Research Park, Silicon Valley, California.

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“I used to have a very narrow view of AI only as a tool for entertainment or, in the distant future, replicating or replacing human effort. However during the talk I learned that AI as it currently ”exists” could be used to solve complex problems such as preventing new banking crises or analyzing huge data sets.”

The Future of Finance 2016

Erik Sier, 12, City of London School for Boys

On the 22-23 March 2016 the second of a series of conferences about complex issues in the financial services sector was held at the Saïd Business School at Oxford University. The conferences were run by my father, Dr. Chris Sier (Finexus), who is interested in these subjects. They aim to bring diverse groups together, including traditional economists, “new” economists, quantitative scientists and mathematicians alongside people from the financial industry, government and entrepreneurs. The first conference was about the structure, regulation, ethics and innovation of the financial services sector. This second conference was about how the use of technology and the use of more data could transform financial services and society. This was the first conference I had ever attended and the subjects were very complicated. It was jumping in at the deep end and I did not understand many things. Luckily, my father was there to help, and everyone was very nice, including Con Keating, who took me through some of the difficult ideas.

There were lots of different sessions but I preferred some to others. The first session was about how Artificial Intelligence (AI) could solve the world’s most complex problems. I found this particularly interesting because I used to have a very narrow view of AI only as a tool for entertainment or, in the distant future, replicating or replacing human effort. However during the talk I learned that AI as it currently ”exists” could be used to solve complex problems such as preventing new banking crises or analyzing huge data sets.

Another one of my favourite sessions was the Financial Inclusion Grand Challenge (FIGC). The FIGC was run by Singularity University, an organization that teaches people how to use technology to solve the world’s most important and complex problems. The entrepreneurs who entered the FIGC had some interesting ideas. One of the winners collected data from farmers in Africa so they could more easily apply for loans. The other winner was a company that helped students learn to manage their money better. All of the ideas helped me think about what I might like to do. For example, I would love to understand better how my money works: how it is used, how much it costs for me to use it, how it works for me, and how it can help other people. My father says this is called transparency. I also found the session interesting because it helped me understand how people could improve their ideas because I could listen to the judges discuss how the ideas might work. In fact they asked me to be a judge as well.

I also heard many words being used that I did not understand, so I wrote down those I did not understand in a list. After the conference was over each day, I asked some people what those words meant and I wrote the definitions down here to remember what I learned. I hope these will be useful.

Erik's Glossary

Balance sheet – A balance sheet is a record of what a company's value is, their assets, debts etc. It is like a Domesday Book, but for companies.

Bitcoin - Bitcoin is a digital or crypto-currency where the currency acts like an asset. The assets value can rise and fall meaning that it is not a legitimate currency. With bitcoin you have an online wallet with your "bitcoin" inside of it and you can make online transactions through devices.

Blockchain – A blockchain is a continuously growing list or book of records of transactions that guarantees a person's ownership of something.

Conglomerates - Conglomerates are big companies that are made up of lots of different parts and smaller companies, e.g. Virgin: airlines, railways, media, etc.

Economics - Economics is the study of the economy, e.g. the study of how companies work and make money together.

Economy - The economy is all of the different companies/people/government that work and make money together.

Hedge fund - A hedge fund is a company that manages other people's money by investing it in higher risk assets, which means there are greater chances of lower return but also a chance of a higher return.

Innovation - Innovation is how people do things in new ways.

Intermediaries - Intermediaries are companies or people who are sometimes in the middle of a transaction. These intermediaries sometime sneakily take some of the value of the transaction.

Mutuals - Mutuals are companies in which the customers own a share of the company, so they receive some of the income and profits of the company.

Opacity - With opacity you and your client cannot see if anything is happening to the product in the transaction. If anything like intermediaries change the product you would not be able to see that this had happened and you and your client would both think you had the right amount of product.

Risk - Risk is the chance and the severity of something bad happening.

Shareholder value – Shareholder value is how much a person's share of a company is worth.

Transparency - With transparency you and your client can both see if anything happens to the product during the process of a transaction. Changes in the product could be due to things like intermediaries but with transparency you would be able to see changes happen.

Collaborating Partners



- ALMANIS. ALMANIS.COM

The wisdom of crowds started when a pioneer of statistical concepts, Sir Francis Galton, ran an experiment at a 1906 county fair. He observed 800 people guess the weight of an ox. No-one got it right.

Galton analyzed the results and found, surprisingly, that the mean of the results was within 0.075% of the correct figure of 1197 pounds. Thus began the journey of unlocking the wisdom of crowds.

Following the Internet's rise we can harness this collective intelligence to improve the way we read our world.

Predictions on Almanis cover geopolitics, industry, market outcomes, healthcare research and even epidemics.



- COINSILIUM. COINSILIUM.COM

Coinsilium is a blockchain technology investment and development company, supporting early-stage blockchain companies through investment, acceleration, development and education.



- COOCONNECT. COOCONNECT.COM

COO Connect is a peer group network of chief operating officers in the investment management industry.



- FINEXUS.

FiNexus is a specialist services entity that facilitates integration between the financial services industry, research centres and SMEs. The e-ecosystem being built by FiNexus will allow problem owners from within the financial services industry to easily and effectively access academics, entrepreneurs, technology companies, HPC centres and data providers in a mutually productive and collaborative way. The core activities of FiNexus are based around the dynamic relationships between challenges and solutions and they provide targeted projects which not only aid discovery but also drive collaboration between members, along with a watching brief on any innovation (Fintech, distributed ledger tech and so on) which might be relevant to the financial services industry and to potential funders (angels, VC, PE and grant funders). FiNexus will also promote positive interaction between policy-makers and the financial services industry and technology providers. It will support entrepreneurial activity, growth and innovation and will provide return opportunities for academic research into financial services.



- INFOCERT. INFOCERT.IT/INTERNATIONAL

InfoCert is a leading player in the field of Digital Transactions Management (DTM) and trusted services. In the last 15 years InfoCert served a significant number of customers, having issued more than 5 million qualified signature certificates, stored 700 million documents in long term law compliant digital preservation and handling every day more than 1 million registered e-mail and dozens of thousands electronic invoices. Building on this high volume law compliant trust services in the last 5 years InfoCert patented and offered to the market innovative paperless solutions, that helped enterprise customers innovate their processes, increase security and improve in effectiveness and cost efficiency, growing from 25 Million euro revenues in 2012 to 47 in 2015.

We develop trust solutions to make every approval, decision and transaction digital combining the usage of document management components, digital preservation, digital signature and registered e-mailing services. Our proposition enables every organization to dematerialize its business processes with simple, efficient, state-of-the-art management solutions which fully meet organizational needs, general regulatory constraints and specific sector rules.

Our mission is to lead and enhance the digitalization in Italy and Europe, implementing solutions that help Public Administrations, Enterprises and Professionals in dematerializing processes, document workflows and communications.



- KNOWLEDGE TRANSFER NETWORKS. KTN-UK.CO.UK

KTN: The Knowledge Transfer Network was established, by Innovate UK, to foster better collaboration between science, creativity and business. The KTN has specialist teams covering all sectors of the economy – from defence and aerospace to the creative industries, the built environment to biotechnology and robotics. The KTN has helped thousands of businesses secure funding to drive innovation, and we support them through their business cycle to see that investment through to success.



- KRYPC. KRYPC.COM/KRYPC

KrypC is a FinTech solution and service provider focusing on bringing innovative solutions in the field of Blockchain & Digital Currency.

The goal of KrypC's technology services is to help businesses understand the power and utility of Distributed Ledger Technology (DLT), assess the potential areas of application, provide technical framework & design and effective implementation of the technology solution.

We integrate and connect real world business applications to the DLT Network. Using our proprietary connectors, businesses can create digital assets, build business rules for asset flow and obtain validation information of transactions and digital assets in the DLT network. Our specialized connectors for financial industry are custom built for money transfer, trade finance and pre-approved loans.



- OMI OXFORD-MAN.OX.AC.UK

The Oxford-Man Institute of Quantitative Finance is a world-leading centre for interdisciplinary research into the financial economy. We answer fundamental questions about financial markets, and develop new quantitative methods and insights with the potential to transform them.

Our researchers have deep and often internationally leading experience in fields that include mathematics, economics, computation, statistics, law, engineering and data science. Their work has shed new light on subjects that range from identifying hidden risks and uncertainties in the financial system to extracting valuable information from noisy market data-streams. We form a bridge between academia and industry. Our co-founder and strongest industrial supporter is Man Group plc, whose research laboratory shares our building and whose staff work closely with OMI researchers to share expertise and identify areas for future investigation.



- PROPLEND. PROPLEND.COM

Proplend is a peer-to-peer marketplace lending platform for sub £5 million commercial real estate debt in the UK. We offer investors, individual and institutional, attractive rates of risk adjusted fixed income returns by unlocking access to individual commercial mortgage assets at higher yields than those offered by traditional Commercial Mortgage Backed Securities (CMBS). Proplend's unique Loan Tranche model splits the borrower's loan across up to three Loan to Value (LTV) based tranches, allowing investors with different risk profiles and return requirements all to participate in the same transaction but different parts of the capital structure. The technology and capital efficiency of the platform offers borrowers an alternative to traditional bank finance and investors attractive returns from 5-15 per cent per annum with interest being paid monthly. All loans are secured by way of a first legal charge over an income producing commercial property. In 2015, Proplend was the second fastest growing peer-to-peer platform in the United Kingdom, according to the Liberum Altifi Volume Index UK.



- SYNDICATEROOM. SYNDICATEROOM.COM

SyndicateRoom is the only UK-based investor-led equity crowdfunding platform.

SyndicateRoom allows its members to co-invest alongside experienced angel investors in highly sophisticated investment opportunities, while enjoying the same economic terms as the lead investors.

SyndicateRoom was founded by Gonçalo de Vasconcelos and Tom Britton, and its own lead investors and advisers are UK Business Angel of the Year Peter Cowley and super-angel Jonathan Milner. SyndicateRoom is authorized and regulated by the Financial Conduct Authority.



- UKTI. UKTI.GOV.UK

Financial Services Organisation (FSO), UK Trade & Investment (UKTI)

Trade and Investment support for the financial, business and professional business services UKTI is the United Kingdom government department that helps overseas companies bring high quality investment to the United Kingdom's dynamic economy, acknowledged as Europe's best place from which to succeed in global business. It also assists and supports local UK companies export, or grow their exports via its vast network of international trade advisors and overseas networks in its consulates and overseas embassies. The UKTI FSO is comprised of a team of dedicated professionals with a sector specific approach to financial and related professional and business services.

The UKTI FSO has two principle aims:

1. To attract high value foreign direct investment (FDI) into the UK
2. To help UK companies grow through international trade

Through our bank of knowledge, extensive networks and teams of specialists UKTI FSO can help identify and leverage potential opportunities, both for trade and investment.