UNIVERSITY OF SURREY

CODE
SURREY CENTRE FOR THE DIGITAL ECONOMY

DIGITAL INTERCONNECTIVITY

A REFORMATION OF THE BANKING SECTOR

– ALAN W. BROWN AND ROGER CAMRASS

IN ASSOCIATION WITH EQUINIX

WHITE PAPER

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FOREWORD

***Equinix* is delighted to be able to support this thought-provoking report on the banking sector, and its response to the challenges presented by the emerging world of Financial Tech (FinTech).**

As the report details, banks—and indeed other established participants in the financial services industry—are all subject to intense and growing regulation, a reality that has perhaps prevented the rapid development of challenger technologies and related competitors. The reality is that just because a newcomer has technology assets, capital and labor, does not mean they will be allowed necessarily to disrupt the current equilibrium.

In stark comparison, while taxi services and hotel provision have now changed forever thanks to newcomers such as Uber and Airbnb, banks have yet to experience any true disruption. Yet the expectations of modern consumers for always-on, customer-focused service standards are there, and banks will, like all other services, need to respond to these changing demands.

By highlighting the sources of digital disruption within the sector, examining the ways that banks traditionally undertake technical development, and suggesting solutions to the conflicting realities of banking service and FinTech, the report shows how these can be combined to make a valuable contribution to finding a workable route forward.

This will require the use of multiple, specialist parties performing their role to provide an overall service to the end-consumer. This in turn will require deep levels of digital interconnection between the participants, so that data can be exchanged rapidly and securely to make the service seamless.

As the world's leading interconnection platform, Equinix fundamentally supports the principles outlined in this report, and we very much hope that you enjoy reading this paper

James Maudslay
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EXECUTIVE SUMMARY

Digital disruption unfolding across the business world has begun to have a transforming effect in the banking sector. With high operating costs and antiquated structures, many of today's incumbent banks may be viewed as attractive targets for focused, innovative start-up companies born out of the burgeoning FinTech community. However, customer inertia and ever-tightening regulation have helped preserve the status quo for these monoliths. Even with the multi-billions of dollars invested so far in FinTech, little has changed for the average banking customer.

Yet the banking sector cannot remain impervious to the digital disruption that has permeated virtually every other area of commerce.

This report illuminates the most likely direction of travel in the banking sector enabled by digital technologies such as interconnectivity, cloud-based computing, mobility, data analytics, distributed ledger technology and web-based service-centric IT architectures. In our view, major elements of the banking sector will undergo massive digital transformation over the next 5-10 years. This will create many new opportunities for both retail and commercial customers.

Driving this transformation is the digital interconnectivity between every link in the value chain, from deposits to payment systems to customer banking services. Modern communications enable the vast explosion of data to flow seamlessly between individuals, companies and national economies. Preserving corporate control over end-to-end financial processes seems to be a losing battle under such conditions. Instead, we see an emerging ecosystem with two different types of organizations participating in tomorrow's financial services marketplace–small, innovative FinTech firms and global transaction platforms.

The small, highly innovative FinTech companies will focus on the customer proposition as well as other key elements of the value chain such as customer identity, security and payments. Much larger and more stable entities will provide the vertical and horizontal utilities that enable these smaller firms to operate at scale and compete head-on with incumbents. This scenario suggests that many existing banks will need to transition to become large transaction platforms that offer secure, compliant processing to support the emerging FinTech community.

The report describes how this new ecosystem might evolve by addressing the following key questions:

- What are the disruptive forces that could help reshape the banking sector?
- How might the players in this sector be redefined into different functional work streams?
- How will key processes such as customer on-boarding evolve over the next few years?
- What are the likely prospects for the big incumbent banks?

The report concludes by examining the implications of this new digital ecosystem for senior banking executives, regulators and investors in the FinTech community.

[1] See for example, http://www2.deloitte.com/uk/en/pages/financial-services/articles/banking-disrupted.html and https://www.uk.capgemini.com/news/news/banks-struggle-to-keep-pace-with-fintech-disruption-finds-world-retail-banking-report-2016

BANKING: THE DAWN OF A NEW DIGITAL ERA

In most leading economies, the banking sector has been dominated by a few large players (for example, the "Big Five" in the UK composed of Barclays, Lloyds, HSBC, RBS and Santander[2]). These monolithic entities have stood their ground for many decades using scale advantage in a highly regulated and relatively static environment. The reality is that banking is a complex system with many interlocking parts. Until now, only the largest players had the financial, technical and managerial resources to knit these multiple components together into customer-ready services.

However, digital technologies offer the promise to smaller organizations that they can break into new areas in the banking sector. In the digital era of hyper-connectivity—enabled by web-based services, distributed processing and open standards—it may well become possible to disaggregate the individual banking components into separate, free-standing enterprises based on their distinct roles. Here we see companies such as Amazon, Microsoft and Equinix as enabling partners. This opens entirely new possibilities for re-casting the traditional and somewhat rigid banking sector into a more dynamic ecosystem consisting of large and smaller players that co-exist to offer an integrated set of services[3].

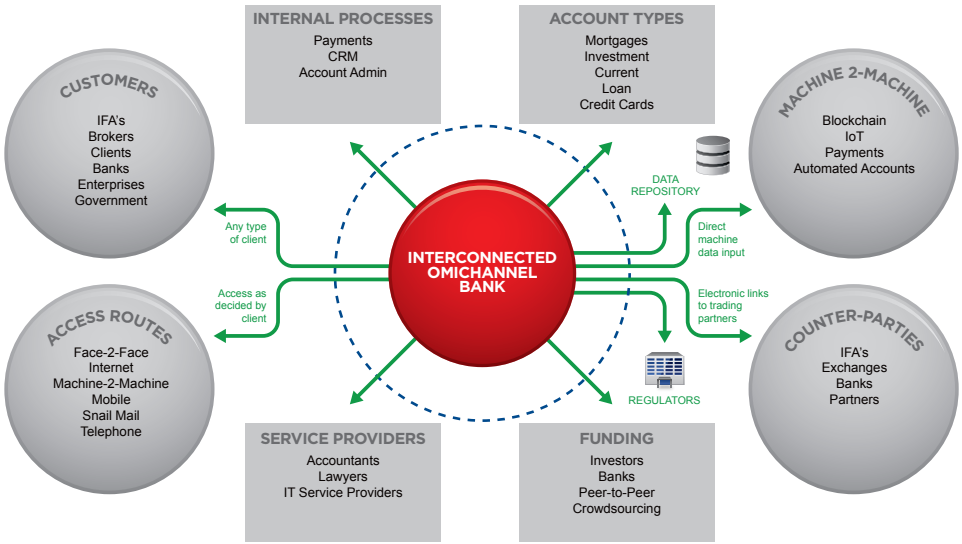

Figure 1 – Prospect of an interconnected banking ecosystem

Billions of dollars have already been invested in FinTech start-up companies with the aspiration that new technologies and business models can be created to define products and services able to compete effectively with incumbent banks for profitable pieces of the banking business. London has become one of the leading hubs for this kind of investment with more than 1,000 such start-ups[4]. With the scale of this activity, a re-partitioning of the banking industry seems inevitable. The leading question today is how will large incumbent banking firms co-exist with agile start-ups in this turbulent and fast moving sector, and how might the regulators cope with the challenges of new technologies, business models and FinTech start-ups?

[2] http://www.advisoryhq.com/articles/top-5-uk-banks-ranking-biggest-british-banks-best-banks-in-the-uk/
[3] http://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/strategic-principles-for-competing-in-the-digital-age
[4] See for example, http://www.techworld.com/picture-gallery/startups/10-fastest-growing-fintechs-3643783/

WHAT ARE THE SOURCES OF DIGITAL DISRUPTION?

Over the last fifty years, we have experienced multiple waves of digital disruption. Among them are the invention of the mobile phone, the world wide web, e-commerce and cloud-based services such as Google and Facebook. While each of these in their turn threatened industry disruption, in practice they had the effect of reinforcing and supporting traditional banking organizations to extend their reach, optimize service delivery and lower costs for serving customers. Despite huge investment in IT systems, most of today's core banking systems originated in the eighties and nineties, and have been through many waves of patch and repair to evolve their capabilities to support new client demands. As identified in our recent report on 'Escaping Legacy'[5], CIOs in large banks see such ageing transaction systems as a major impediment to supporting new practices, as maintaining and evolving them places a heavy constraint on product development.

Only recently have we begun to see clear signs of change, with many banking services becoming accessible via the web and mobile devices. This new accessibility has been accompanied by a push toward greater transparency in pricing across the many different services and transactions that constitute typical banking operations. Such changes are leading inevitably to pressure from consumers, partners and competitors to redesign banking services for the needs of the digital age.

Consequently, despite the many decades of relative stability and consolidation, banking is facing major disruptive forces associated with the new digital era. The Surrey Centre for the Digital Economy (CoDE) categorizes these as:

Hyper-connectivity – a combination of fixed and mobile network technologies that provide high-speed access from machine and human sources to powerful computer centers that are themselves interlinked across the globe. The recent era of 3rd and 4th Generation mobile networks has created entirely new opportunities for mobile banking services. The rollout of 5th Generation mobile services in the next 2-3 years will further accelerate such interconnection and bring with it context-based products to invigorate the consumer space.

Explosion of data – the consumerization of IT in the shape of smart phones, tablets and wearables has expanded the sources of personal data by orders of magnitude, as has the advent of social media channels such as Facebook and YouTube. Companies such as Google and Amazon are now applying Machine Intelligence to analyze and exploit such data. The Internet of Things (through the deployment of intelligent sensors in homes, offices and cities) will further expand the amount of data available.

Cloudification – the ability to connect organizations using cloud-based platforms is giving rise to entirely new business models across different commercial sectors. The availability of cheap, scalable cloud-delivered services is also becoming a powerful mechanism to help smaller companies reach global scale without the need for large amounts of investment capital. Such cloud platforms are enabled by the sort of mega data centers that are operated by companies such as Equinix.

[5] Surrey CoDE, "Escaping Legacy: Removing a major roadblock to a digital future", Whitepaper, 2016 available at www.SurreyCode.org

New software and systems architectures – the emergence of new technological solutions for managing and analyzing large data sets is redefining software and systems architectures for large-scale transaction processing. More generally, this is leading to scalable enterprise systems constructed by composing a variety of cloud-based services in what some now call "serverless architectures"[6]. Of importance to banking is the advent of the Distributed Ledger Technology (DLT), or Block Chain, which could fuel future innovation in this sector. DLT enables transactional information to be distributed across multiple organizations, while ensuring the integrity of the data through cryptographic technologies. They can be employed anywhere trust and authenticity are important, such as identity schemes, supply chain provenance and payments systems. In addition, they can be designed to carry smart contracts, where a future event could require automated action or a payment, and have the potential to turn the Internet of Things into the internet of value transactions. There may be little need for centralized ledgers in the future such as those provided by the large banking incumbents today.

Taken in their entirely, the combination of such digital developments has the potential to transform the banking sector by enabling small, agile FinTech start-ups to compete with or co-exist alongside the large incumbent banks. This enables us to envisage a radical new digital landscape for one of the world's largest and most established business sectors.

[6] For an overview of these architectural directions, see http://martinfowler.com/articles/serverless.html

A NEW CONFIGURATION FOR THE BANKING SECTOR

Using a scientific analogy, we foresee the break-up of large and complex banking "molecules" into their "atomic" sub-components with the emergence of a different set of solutions re-combining those elements. The question we may now ask is: what is the nature of this new "periodic table" for the banking sector?

A review of the emerging landscape reveals four different types of entity that will populate the new digital banking sector, as illustrated in Figure 2. These include components that are specially designed for the sector such as *Proposition Innovators* and *Core Utilities*; supported by broader elements such as *Functional Innovators* and *Giant "Horizontal" Utilities*.

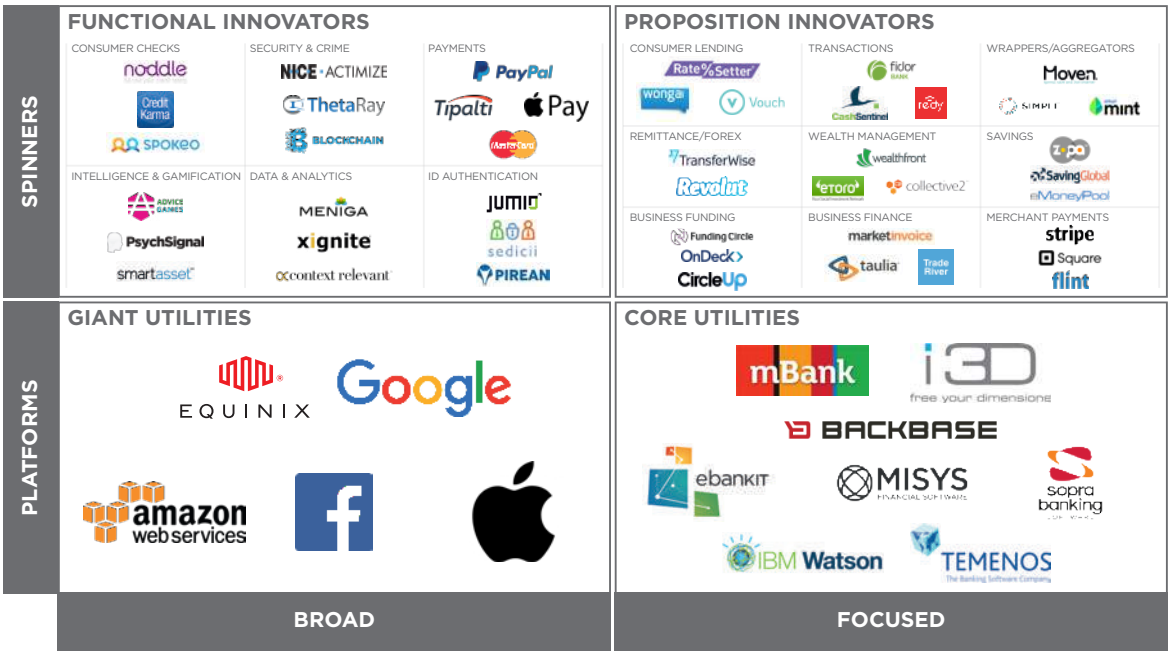

Figure 2 – Four different 'atomic' components of the digital banking sector
Source: Dr Phil Falato, Leading Edge Forum, 2016

The *proposition innovators* are the most interesting entities to us, as customers, as they face directly out to the marketplace and offer new products with improved user experience. This is where the FinTech activity is at its zenith today, with well-known names such as Mint, TransferWise, eToro and Funding Circle bringing new ways to save, spend and exchange money.

The *functional innovators* provide all the necessary tools for the proposition innovators to operate efficiently and at the same time deliver genuine market innovations. Examples of functional innovators include ID Authentication (PIREAN and JUMIO), Payments (PayPal and Apple Pay), Gamification (Advice Assets) and Security (NICE-Actimize). Such companies operate as business services to the proposition innovators, enabling the latter to focus on their primary source of value–product and service enhancement.

Finally, there are the *core utilities* that provide the "heavy lifting" equipment for the above two categories. Examples of such core utilities include large-scale transaction processing systems (Temenos) and omni-channel digital banking channels (Backbase). These companies enable the proposition innovators to scale up rapidly to take on the large incumbents. Many of the recent start-up banks such as Metro Bank in the UK employ few, if any internal, IT systems. Instead, they depend largely on external cloud-based services such as Temenos' banking transaction software.

Ultimately, all these components require a flexible reservoir of computing and storage capacity to operate efficiently, especially when competing with the large incumbent banks which have legacy multi-billion-dollar system investments to support their large transaction processing volumes. Such raw, interconnected computing power has become the domain of the *giant utilities* such as Amazon Web Services, Google Cloud, Microsoft Azure and Equinix.

ILLUSTRATION OF CONNECTED BANKING: CUSTOMER ON-BOARDING

To understand the implications of the new order for banking, consider the impact on critical processes such as customer on-boarding. Virtually all financial product sales are initiated with an on-boarding process that recruits an individual or business customer. With the advent of multiple channels for customer engagement such as branch, web and mobile, customer on-boarding must adapt to different physical and electronic environments.

What we see when we break apart the end-to-end on-boarding process into its components is a set of six sequential steps, starting with customer identification and completing with an electronic or paper contract. The intractability of adapting existing deployed core banking systems results in most large incumbents recreating this process in separate software every time they launch a new service. It is common to find all six elements repeated multiple times in just one bank, implying a heavy overhead cost structure.

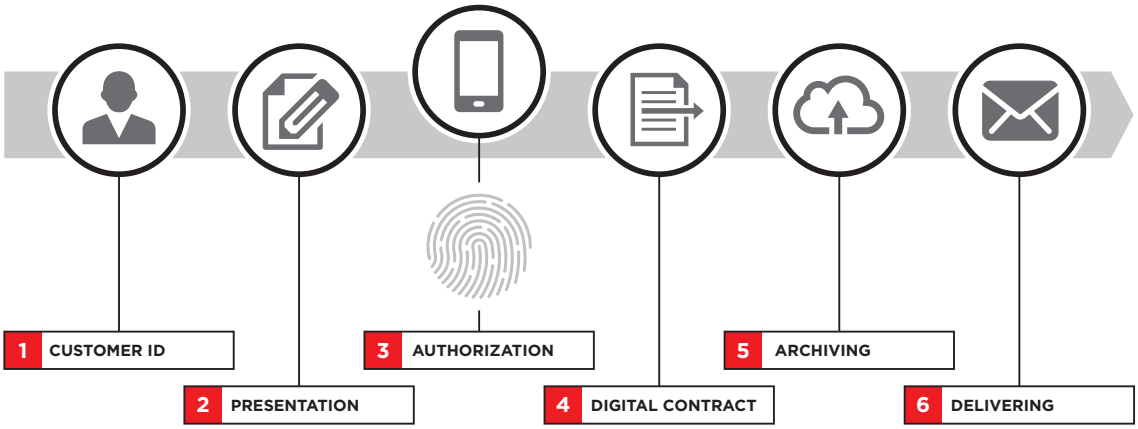

Figure 3. Six step process for customer on-boarding

Examining the underlying technologies in a typical on-boarding process, we see six separate technology pillars, supported by four enabling structures or platforms. The pillars include an electronic signature module that can detect fraud, a document imaging module to capture information and speed workflow, and E-forms that simplify data capture. The supporting structures include back office processes, technology enablers, legal and regulatory modules, and operational risk managers.

The on-boarding process can be undertaken by a number of different parties, but will always conform to the same set of steps. For example, a relationship manager within a brokerage house might discuss a particular client's need, and call up an appropriate financial product on his or her iPad. Alternatively, a potential customer for a new banking product may search the web and complete the process directly on the screen. In either case, the customer progresses through the same six steps to complete authentication and approval.

In this disaggregated view of financial services, it is quite possible to identify separate organizations that are well qualified to deliver particular elements of the above process in a flexible and efficient manner. For example, EXPERIAN can perform a credit check on the prospective customer; PEGA can provide the workflow engine that links each sub-process step into a continuous delivery mechanism; EURONOVATE can manage the e-signature sign-on. Such a combination of parties is illustrated in Figure 4 and demonstrates how a complex end-to-end process can be shared between qualified parties.

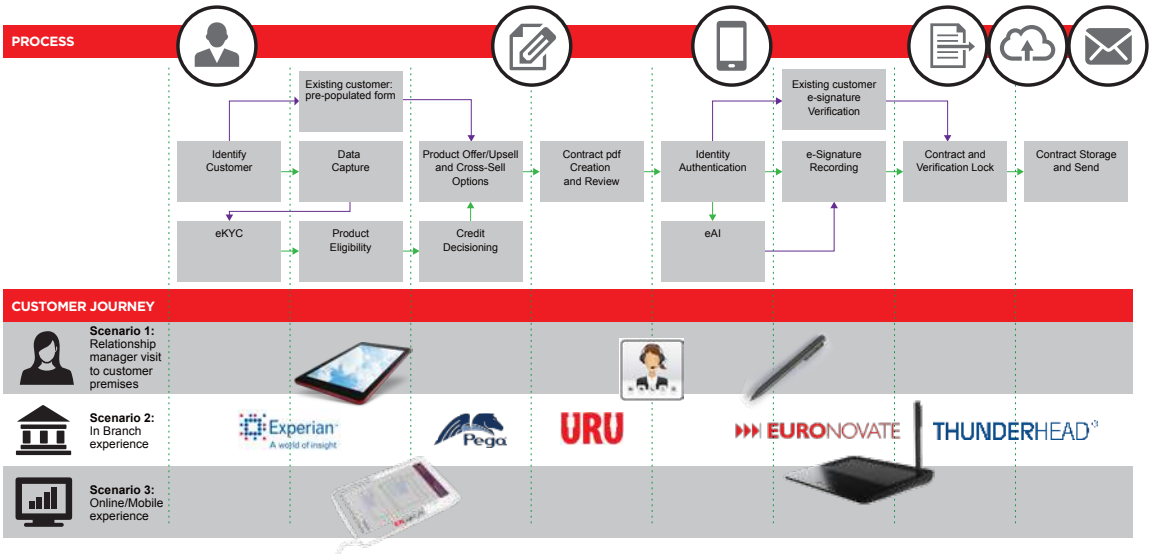

Figure 4. Paperless on-boarding IT platform

Source: Dr Phil Falato, Leading Edge Forum, 2016

The benefits of combining such highly qualified and specialized companies can include a more user-friendly customer experience, a high degree of flexibility in terms of available channels, speed of completing the process, and associated efficiencies relating to re-use of software assets and capabilities. Given the speed of innovation occurring in many of these areas, we can also expect continuous improvement in service quality.

THE CORAL REEF AND THE DEEP BLUE SEA

The concept of disaggregating everyday banking processes such as customer on-boarding into their individual components has been understood for many years. In *Atomic: Reforming the Business Landscape into the New Structures of Tomorrow*, the authors describe a bi-polar world of small, highly adaptive organizations that worked in partnership with large, process-driven platforms[7]. This is the metaphor of the "coral reef"—populated by brightly colored, fast-moving fish —and the "deep blue sea"—inhabited by sharks and large mammals such as whales; together they create a balanced ecosystem.

The challenge today is for the large incumbent financial institutions to exploit their strengths and mitigate their deficiencies so that they can make room for the small, innovative FinTech companies that are beginning to populate the "coral reefs." There should be a natural harmony between these two-different "species" so that they can deliver much improved services to the customer. In line with experiences from other domains, this may play out in the following manner:

> The FinTech players (coral reef) thrive on their ability to constantly develop and launch new customer propositions that find rapid acceptance in the marketplace. The FinTech culture is all about generating high capital value for investors, as seen in the entrepreneurial environments of Silicon Valley and the UK's Silicon Round-About.
>
> The financial utility players (deep blue sea) continue to sustain themselves by operating secure, compliant and efficient processes that work at global scale. Such entities embrace longevity and produce a strong dividend flow, as in the case of comparable infrastructural entities such as energy, telecommunications and transportation.

Today, we are still some distance from achieving such harmonious co-existence, but the financial institutions recognize that in the emerging era of distributed ledgers and digital currencies such as BitCoin, there is an imperative to adjust to this new and radical paradigm.

[7] R. Camrass and M. Farncombe, *Atomic: Reforming the Business Landscape into the New Structures of Tomorrow*, Capstone Publishing, 2003

BUILDING THE FUTURE FOR THE LARGE BANKING INCUMBENTS

Since the banking crisis of 2008, most large banks have been preoccupied with meeting ever-tighter regulations and the capital constraints that have been imposed by governments across the globe. Many have also been wrestling with mega-mergers (e.g., Lloyds and HBOS) that were a consequence of the crisis. These activities have left little management time or investment capital to address the existential threat posed by the digital revolution.

As the dust of the banking crisis begins to settle, there is an exploration taking place across the banking sector as to what role, if any, these large organizations should play in a more adaptive and digital financial universe. Global structural reform in the banking sector is forcing every banking institution to revisit how it sees its role and the organizational structures that support it to deliver on its mission. Furthermore, regions such as China moved directly to electronic banking, which could pose a serious commercial challenge to our more conservative Western banks. At the same time, digital technology and service providers such as Amazon, Apple and Microsoft have been surveying the financial services landscape to find lucrative vertical opportunities into which they can apply their capabilities and expertise.

Our recent experience of speaking with leading UK and US banks suggests that there is a growing recognition that to survive they must exploit their scale and financial competencies to occupy sustainable positions in the emerging digital landscape. The first step is to work with companies such as Amazon, Equinix and Microsoft to augment the supporting technology infrastructures and systems that currently represent high levels of fixed cost and contribute to unsustainable cost-to-income ratios of 30-50%. According to our earlier research focused on the financial services sector[8], many large banks such as JP Morgan and UBS are involved in significant investments to re-architect their technology infrastructure, including adopting a combination of public and private compute platforms to boost core compute performance and increase flexibility for handling a variable demand for services.

Examples: JP Morgan Chase and UBS

The Chief Information Officer at JP Morgan Chase is making public cloud computing a significant part of the bank's IT strategy, a lead that most U.S. banks have been too cautious to take. By the second half of 2017, the bank plans to run proprietary applications over the public cloud, and at the same time launch its own internal cloud version, Gaia.

This may well be the first major journey into public cloud in the banking sector. Combining public and private cloud services will give JP Morgan Chase a flexible and cost-effective hybrid platform to accommodate new applications developments as well as peak transaction periods.

Our perception is that such a journey will herald a new era of banking based on near infinite-scale cloud computing platforms that companies such as Amazon and Equinix are well-qualified to operate on their behalf. Such platforms could support both incumbents and FinTech newcomers.

At the same time, Swiss Bank UBS is spending $1Billion on its wealth management IT infrastructure to bring together a fragmented set of assets into a single global platform. This will enable to the bank to standardize processes and exploit scale in its back office. Again, our perception is that such a move will create the ideal platform for functional services that could be shared by multiple incumbents as well as start-ups.

Despite deep regulation and conservatism across the banking community, the signs are that the time is now right for radical changes to IT infrastructure and business processes. This will enable incumbents to address new commercial opportunities and bring down operational costs.

http://www.americanbanker.com/news/bank-technology/unexpected-champion-of-public-clouds-jpmorgan-cio-dana-deasy-1091539-1.html

[8] Surrey CoDE, "Escaping Legacy: Removing a major roadblock to a digital future", Whitepaper, 2016 available at www.SurreyCode.org

The likely outcome in the modernization of banking infrastructure is a small, core holding of private data center and network facilities that can accommodate average transaction loads. Much of the peak load will be automatically diverted to public cloud facilities that offer near infinite capacity at far lower prices. Progressive banks regard cloud-based service providers such as Google and Amazon Web Services as their commercial benchmark for computing and storage power. This is frequently half the cost of private facilities, and invites new opportunities to build additional services around the cloud-hosted services architecture.

Another key player on this new digital infrastructure landscape could be the service integrator that helps knit together the many commodity platforms that are emerging due to cloudification. This might be a logical extension of the current role of the large global data center players such as Equinix, who have already learned to master the complex world of interconnectivity.

In addition to modernization of infrastructure, banks are looking at ways of adapting their legacy transaction systems—frequently operating in batch mode—to meet the demands of real-time, online banking. Rather than cannibalize legacy systems, some of which have worked efficiently for many decades but are now expensive and fragile when undergoing change, the banks are peeling off functionality and sourcing this from emerging functional innovators. For example, many of the traditional Enterprise Resource Planning (ERP) functions can be undertaken far more effectively by cloud-based service providers. This is now frequently seen in the case of Customer Relationship Management (CRM) via companies such as Salesforce, and Human Resource Management (HRM) via companies such as Workday. The ultimate goal in many cases is to peel back the many layers of legacy applications to expose the customer data that is a genuine source of value to the bank. This will give new applications easier access to such data, thus enhancing agility and competitiveness.

In the process of transforming infrastructure and de-layering legacy applications, we expect that banks will begin to re-evaluate their fundamental mission and purpose in the emerging digital ecosystem. In our view, one likely realization is that a large bank becomes a global platform to support a diverse ecosystem of FinTech players in much the same way that Apple iStore has become the home for many thousands of media and entertainment start-ups. The success of platform-based business models in these other domains points to a potential for large banks to consider a similar role in their sector—where they take advantage of network effects to extend their reach and bring providers and consumers of financial services together via common infrastructure, processes and services[9]. In this regard, the seminal book by Surrey CoDE's Annabelle Gawer, Platform Leadership, offers clear guidance for banks on the key steps to take this strategy forward[10].

[9] https://thefinancialbrand.com/57619/banking-as-a-platform-baap-structure/

[10] A. Gawer and M. Cussumano, *Platform leadership: How Intel, Microsoft, and Cisco drive industry innovation*, Harvard Business School Press, 2002

RE-ENERGIZING THE LARGE BANKS?

As previously highlighted, banks typically reinvent every element of an end-to-end process when they launch a new product or service. This creates a legacy of cost and complexity that could be avoided as architectures emerge based on disaggregation of services. The goal is that as a bank establishes separately each component of the many processes that serve the customer, it could achieve re-use of such components instead of constantly reinventing them in new software. Implied here is a new set of skills focused around product managers and small associated teams that can knit together these micro-services into a fully-fledged offering. This represents a significant shift in culture for most banks.

In this sense, a large bank begins to "atomize" its own structure into individual proposition innovators and functional innovators. These can then be combined under a web-based service architecture to deliver any type of end customer product. The efficiencies are compelling, but this would require a wholesale transformation of the bank's internal structure. It might best be achieved by a series of acquisitions of key players in the proposition and functional areas. As such, many banks are today surveying the FinTech community for such transactions, with several banks already active in acquiring new technology-leading solutions to incorporate into their infrastructure offerings[11].

[11] For some recent examples, see http://www.pivotl.com/2016/04/15/5-fintech-acquisitions-illustrate-where-the-sector-is-heading/ and http://www.cnbc.com/2016/04/11/big-banks-shift-fintech-strategy.html

Banking Management

There are some practical ways in which senior executives of mainstream banks can prepare for the impending digital era. Equally, those managers in charge of newer FinTech companies will need to consider their relationship with large incumbents. Here are some suggestions for incumbent banking executives:

Build awareness of the new digital era—pre-occupation with the post-financial crisis era has distracted many senior executives from digital developments. It appears timely now to bring some of the new concepts such as cloudification, machine intelligence and data analytics to the attention of Boards and middle management. In addition to formal training, decision makers in the organization should improve their understanding of problem solving and leadership in a digital economy by working with experienced groups such as MIT's Initiative for Digital Business and the University of Surrey's Centre for the Digital Economy (CoDE). Additionally, Boards should visit innovation hubs in London, Palo Alto and Tel Aviv to witness at first-hand what FinTech companies are doing, and how they may wish to partner with established firms.

In cases such as Citibank in Israel and Barclays in Canary Wharf, management is actively investing in incubators to attract talent and to experiment with new concepts. This helps to motivate internal staff to participate in real-life projects rather than just attend conferences. It also provides a lens onto the FinTech community, with implications for capturing vital intelligence.

Develop digital roadmaps—in today's fast-moving and highly volatile business environment, the viability of five-year plans and associated business strategies is under question. Instead, Boards need to develop a vision of what they aspire to become, and start to plot out a roadmap to help them navigate into the desired future. Flexibility in such planning is essential. Inevitably, the roadmap will evolve over time as external conditions continue to change. However, there is no excuse today for inactivity. Every step along the digital path brings learning and possible new sources of commercial value.

One of the most common approaches here is to undertake a succession of innovation sprints that are designed to test out planning assumptions, and create minimum viable solutions that can be scaled where appropriate. Such sprints can be undertaken in weeks and can yield substantial learning based on tangible prototypes ready for market testing. Organizations such as Barclays have invested in such prototyping labs that enable combinations of internal teams and external partners to test out and validate new concepts at the process and product levels.

Focus on capabilities rather than structures—most banking executives have succeeded in their careers through an ability to build and operate complex, hierarchical structures that have been appropriate to stable historic environments. As the digital era materializes, many of the traditional management skills required to get to the top of an organization appear less and less relevant. Instead, management must acquire new capabilities that deal directly with volatile and fast-evolving external conditions[12].

At the technical level this can mean supplementing existing skill sets with those that support a more integrated approach to development and delivery (DevOps) to accelerate time-to-value for software-intensive projects. Large IT departments often prefer to partner with specialist companies such as Pivotal to acquire such skills. In many cases, the most effective way is to encourage cooperation between traditional and innovative organizations.

[12] S. Denning, *The Leaders Guide to Radical Management: Reinventing the workplace for the 21st century*, Jossey Bass, 2010

A further core skill for the digital age is service integration—the ability to source external services and partnerships to supplement internal capability. This requires new process knowledge and associated tools sets to undertake the knitting together of a diversity of different services. Years of aggressive outsourcing have depleted these skills within many banks. It is time to bring them back in-house to capitalize on an increasingly commoditized market for IT services.

Learn to operate in an increasingly diverse ecosystem—perhaps the hardest lesson for large organizations is how to partner with small, agile firms such as those that inhabit the FinTech community. The cultures and goals are often at variance and lead to rejection on the part of the larger entity. Many banks today are investigating how to operationalize the process of "innovation diffusion" in building new competencies such as DevOps, and achieving new partnerships in the case of product innovation.

Our considered view is that the only effective way forward here is to invest time in practical projects that involve a diversity of partners, recognizing that many of those projects might fail initially. One of the inescapable conclusions of the new digital era is that failure is an integral component of learning. Participation in innovation hubs is one practical approach. Applying new techniques from FinTech companies into current banking operations is another viable route taken by many incumbents.

Implications for Investors and FinTech Management

Entrepreneurs who typically run FinTech companies often start at the opposite end of the spectrum from traditional banking managers. Their ambitions are frequently based on rapid business growth and capital accumulation rather than longevity, and they are encouraged to plan for "liquidity events" that reward them and their venture investors handsomely for their efforts. Such environments favor risk-taking and experimentation rather than long-term planning. Consequently, processes and structures may be relatively weak and unable to stand up to heavy transaction volumes associated with market success.

To compensate for such shortcomings, start-ups should seek support from large banks to help industrialize operational processes that can sustain heavy transaction volumes. At the same time, banks can benefit from the innovative mentality of the start-up teams. Such cross-cultural exchange can best be deployed in joint partnerships that we described earlier (e.g., innovation labs). The secondment of experienced senior bankers to start-up boards is also helpful in anticipating bottlenecks and challenges in steep growth scenarios.

Implications for Regulators and Governments

The rate of development of technology has always been a challenge for regulators and governments. Assessing the impact of technological change is virtually impossible until tangible use cases emerge from start-up environments. By that time, regulations trail far behind commercial developments. In the worst case, regulatory regimes impose stringent controls that can inhibit innovation and discourage investment in new start-ups.

Regulators should act on behalf of the citizen, who demands constant improvements in banking services. In this situation, the regulator should be a champion of the digital era rather than a blocker. We believe that closer association with leading academic and commercial organizations can only improve the positive role of regulation, rather than stifle innovation.

DIGITAL PRACTICES FOR THE BANKING REVOLUTION

This report offers a radical proposal for the banking sector based on disaggregation of players into at least two separate categories—the "coral reef" and the "deep blue sea" scenario. Already we see the emergence of many new FinTech companies who are competing for lucrative niches in this sector, such as currency exchange, payments and peer-to-peer lending, often through monetizing parts of the value stream the incumbents find difficult to access or provide, such as the customer's quick reaction times. The energy and ambition of the FinTech companies far exceeds the ability of the large incumbents to react or respond to the onslaught.

Our view is that boards of leading incumbent banks should consider more radical scenarios for the future of their sector and evaluate the opportunities and risks associated with such developments. Only by experimentation will these seasoned executives learn to escape from a traditional low-risk culture and begin to navigate through the coming period of turbulence and change.

ABOUT

Alan W. Brown

Alan W. Brown is Professor of Entrepreneurship and Innovation at the University of Surrey's Business School. He has over 25 years of experience in commercial high tech companies leading R&D teams, building leading-edge solutions, and driving innovation in software product delivery. He is the founder and director of the Surrey 'Centre for the Digital Economy' (CoDE). His most recent co-authored book is "Digitizing Government: Understanding and implementing new digital business models".

Roger Camrass

Roger Camrass is a visiting professor at the University of Surrey and co-founder of the Surrey 'Centre for the Digital Economy'. Whilst at MIT in the seventies, Roger was a lead architect of today's Internet. Over forty years, he has helped Fortune 1000 companies harness the power of successive waves of technology. He is author of the book 'Atomic: reforming the industrial landscape into the new structures of tomorrow', and a specialist on new business models.

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CoDE (University of Surrey)

The University of Surrey's Centre for the Digital Economy (CoDE) investigates the emerging patterns of the Digital Economy through a process of Collaborative Discovery that blends research, education, problem-solving and brokering. We engage in this process with enterprises large & small, researchers and students in our Business Insights Lab. We explore topics such as digital platforms, emerging business models, cryptocurrencies and Agile innovation by combining cutting-edge business experimentation with classic methods of research. We believe that Collaborative Discovery will help us navigate – together – a world that is uncertain, unpredictable and unrecognisable to traditional business models.

http://surreycode.org/

Equinix

Equinix connects the world's leading businesses to their customers, employees and partners inside the most interconnected data centers. In 40 markets across five continents, Equinix is where companies come together to realize new opportunities and accelerate their business, IT and cloud strategies. In a digital economy where enterprise business models are increasingly interdependent, interconnection is essential to success. Equinix operates the only global interconnection platform, sparking new opportunities that are only possible when companies come together.

http://equinix.co.uk

NOTES

This paper was written by the University of Surrey in association with Equinix.

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Digital Interconnectivity White Paper v1116 WP-EN RP-DC 1116 Q416