

Law and Regulation of Electronic Finance and Internet Banking

Unit 1 Introduction

Contents

Unit Overview	2
1.1 The Promise of Internet Banking	3
1.2 Digital Products and Services	10
1.3 Data Aggregators and Payment Systems	13
1.4 The Rise of Fintechs	17
1.5 Fintechs and Banking	19
1.6 Millennials and the Business of Banking	21
1.7 Banks and Big Data	22
1.8 AI and Banking	23
1.9 Cryptocurrencies	24
References	25

Unit Overview

Unit 1 commences with a brief essay on the advent of internet banking, tracing its development from pure internet banks to a universally accepted alternative delivery channel for banking services in addition to, not in lieu of, traditional bricks-and-mortar branches. It will also describe several of the more popular banking products and services delivered via digital channels.

As internet banking is in a continuous state of development – affected not only by advances in technology, but also by consumer preferences and behaviours – the unit will address developments affecting banks related to: payment systems and open banking, financial technology companies (fintechs), banks and ‘big data’, millennials and banking, and use of big data by banks.

Lastly, the unit will note the emergence of cryptocurrencies despite the fact that relatively few jurisdictions have accepted them as legal tender for debts, public or private.

Learning outcomes

When you have completed your study of this unit and its readings, you will be able to:

- discuss the development of internet banking from conception to present-day practice, including how millennials view their relationship with banks
- describe types of digital banking products, including payments systems and the concept of open banking
- identify different categories of fintechs and how they are affecting internet banking
- observe the effect that artificial intelligence and ‘big data’ are having on the business of banking
- explain the fundamental principles of cryptocurrencies.



Reading for Unit 1

Robert DeYoung (2001) ‘The financial performance of pure play Internet banks’. *Economic Perspectives – Federal Reserve Bank of Chicago*, 25 (1), 60–75.

Sanjiv Singhal (2003) ‘Scrambled eggs, clipped wings and yet a reason to smile?’ In: *Internet Banking: The Second Wave*. New Delhi: Tata McGraw Hill Education.

Louise Brett, Harvey Lewis, Sulabh Soral and Neal May (2014) *Bricks and Clicks*. London: Deloitte LLP.

Philip Rutledge (2016) ‘The migration to online lending and rise of private regulation of online financial transactions with business customers’. *Financial Stability Review*, 20 (April), 93–100.

Deloitte Center for Financial Services (2017a) *2018 Banking Outlook*. Deloitte Development LLC.

Open Banking (2018) *Background to Open Banking*. London: Open Banking Ltd.

Deloitte Center for Financial Services (2017b) *Fintech by the Numbers: Incumbents, Startups, Investors Adapt to Maturing Ecosystem*.

Val Srinivas, Steve Fromhart and Urval Goradia (2017) *First Impressions Count: Improving the Account Opening Process for Millennials and Digital Banking Customers*. Centre for Financial Services, Deloitte University Press.

1.1 The Promise of Internet Banking

1.1.1 Technological developments

The continuous development of technology (following Moore's law that the power of computing doubles every 18 months) has made delivery of all manner of products and services over the internet possible and at significantly lower costs to customers and providers.

According to a 2018 US Treasury report (US Department of the Treasury, 2018), financial services are being reshaped significantly by, among other things: (1) rapid advances in technology; (2) increased efficiencies in the rapid digitisation of the economy; and (3) an abundance of venture capital available to innovators. (The US Treasury estimates that US\$ 117 billion of venture capital was invested globally into financial technology from 2010 to 2017 with the US accounting for half of that total.) By 2020, digitised data is forecasted to be generated at a level that is more than 40 times the level produced in 2009. According to the 'statista' website, the number of internet users worldwide in the past five years has grown from approximately 2.6 billion in 2013 to approximately 3.9 billion in 2018 (statista, nd accessed 2019). Globally, it is estimated that there are 27 billion devices (tablets, smartphones, laptops, computers, etc) connected to the internet with 125 billion connected devices expected by 2030.

As more and more of the world's population are gaining access to the internet, infrastructure in some developing countries has leapt over telephony and gone directly to internet connectivity. Recent broadband connections brought by undersea cables, especially to Africa, are expected to result in an explosion of additional users of online services. In general, the internet has affected those providing products and services by the following:

- providing customers with more choice and customisation options
- enhancing price and product discovery and comparison by decreasing search time and enabling sites or companies to serve as data aggregators
- expanding markets beyond regions or countries where the provider has a physical presence with minimal capital costs in equipment or staff
- reducing the time between the outlay of capital and the receipt of payment from the customer

- permitting just-in-time production through the electronic receipt of orders
- facilitating increased automation through internet data interfaces
- decreasing costs associated with physical delivery such as labour, transportation, distribution and storage costs
- lowering barriers to entry to business thereby fostering competition and keener prices for consumers
- enabling automated data to be easily captured, stored and manipulated to provide instant historical comparisons and trends in production time and costs, payment and design changes.

The effects of the internet revolution cited above apply equally to the delivery of banking products and services. Use of the internet allowed banks to deliver standard and expanded banking services to more customers at a lower cost than through bricks-and-mortar branches. Furthermore, the reach of the internet far exceeds anything that a single bank could achieve in building a proprietary network, again at much lower cost. By using the internet, domestic banks are now able to court new customers around the world with minimal marketing costs, while international banks are able to roll out new products and services to all their global customers at the same time, as well as testing potential new markets to determine the profitability of establishing a physical presence elsewhere.

Growing in parallel to these improvements in data and connectivity are the expanding complementary technologies of cloud computing and machine learning (or artificial intelligence). Other technologies poised to impact innovation in financial services include cryptography and distributed ledger technologies giving rise to blockchain-based networks.

Technology is also a great leveller of artificial barriers to entry. The size of a bank now has little bearing on its ability to offer products and services to a wide array of potential customers via the internet. Use of the internet also permits banks to offer additional products and services, such as share dealing, which they might not have been able to provide through a traditional bricks-and-mortar branch network due to significant start-up costs.

Technology has permitted the convergence of many financial management transactions that previously were considered disparate. This has opened the path for offering banking products and services to customers with different banking needs such as corporations, small businesses and individuals all within one internet-based platform. Corporate treasurers can engage in significant cash management transactions on the same platform that an individual might use to check the balance on a current account or a small business person to apply for a commercial loan.

In addition to providing products and services, banks also have made ancillary financial management tools accessible on their internet sites to assist customers in household budgeting, looking up current account or savings balances, and providing current rates on all types of loan and savings products.

1.1.2 Early visions of internet banking

In the late 1990s and early 2000s, conventional wisdom was that internet banking was the way forward and eventually there would be little use for bricks-and-mortar banks. Pure internet-based banks with interesting names such as Smile and Egg in the United Kingdom and Wingspan in the United States were viewed as the wave of the future. All were backed by established financial institutions (Cooperative Bank in the case of Smile, Prudential in the case of Egg and Bank One – now part of JP Morgan – in the case of Wingspan) so these were no neophytes to banking. None of these ‘pure play’ internet banks now exist. What happened?

Part of the reason for the demise of pure play internet banks was the low barriers to entry which the internet affords. Most were new so they had no existing customer base. The main way to attract customers was to offer better rates on credit or deposit products. However, these rates could be matched or bettered by traditional banks with existing customers who would subsidise the ‘internet only’ special offer rates, or by other pure play internet banks competing for the same customer. As pure play internet banks were new, there was no existing customer loyalty or long-standing customer relationship to militate against the customer leaving for another pure play internet bank solely for the rates on offer. Also, the rates-based competition among pure play internet banks resulted in negative net interest margins, leading to annual losses and reduction in shareholders’ capital. Such a model could not be sustained in the long run.

The Federal Reserve Bank of Chicago noticed these trends and reported that pure play internet banks were significantly less profitable than the average branching bank. It also found that pure play internet banks tend to grow fast but with low (or no) profits (DeYoung, 2001).

In addition, pure play internet banks, by definition, were dependent on technology. Some of their systems crashed when too many people visited their internet sites, usually in response to special offers designed to attract custom. When an internet bank’s systems cannot handle customer demand, it does not instil consumer confidence, and it leads to the internet bank becoming a less attractive alternative to traditional banking.

Hence, Smile, Egg and Wingspan have all vanished. ING’s primary internet banking venue in the US, ING Direct, has been sold to Capital One. In the US, Ally Bank – which is the re-incarnation of the US government-rescued General Motors Acceptance Corporation (originally the finance arm of General Motors) and which increasingly provides a wide array of non-auto-related financial services – remains the most, if not the only, nationally recognised bank in the US that delivers its products and services primarily via the internet.

Fast forward to 2018, and Perk Street and Bank of the Internet have joined Ally Bank and ING Direct in the US. Atom, Monzo, Starling and Tandem have recently opened as internet only banks in the UK. However, some of those have faced licensing issues and are highly dependent upon backers

with deep pockets, many of whom have no previous experience in banking. It is unknown whether these internet-only banks will survive in the long term or go the way of their early 20th century predecessors.



Readings 1.1 and 1.2

Please first read Robert DeYoung's article 'The financial performance of pure play Internet banks', followed by Sanjiv Singhal's chapter 'Scrambled eggs, clipped wings and yet a reason to smile?'.



When you have finished the readings, write brief notes on the following question.

- Why did 'pure play' internet banks not sustain themselves in the marketplace and not replace 'bricks-and-mortar' branches as many had predicted?

DeYoung (2001) 'The financial performance of pure play Internet banks'. *Economic Perspectives – Federal Reserve Bank of Chicago*, 25 (1), 60–75.

Singhal (2003) 'Scrambled eggs, clipped wings and yet a reason to smile?' in *Internet Banking: The Second Wave*. pp. 3–48.

1.1.3 Need for trust and validation

The business of banking is one of trust – we trust our money to banks rather than to other people – and therefore we view banks and banking as something special. Banks are an essential element in a free enterprise system which transforms idle capital in the form of deposits into working capital in the form of loans for a fee. The fees are collectively known as a bank's *net interest margin*, which represents the price paid to the bank in interest on the loans minus the price paid by the bank to depositors as interest on their funds. Although all bank regulators require banks to maintain certain minimum capital in reserve at all times, it never equals the deposit liabilities. Therefore, a 'run' on bank deposits is a bank regulator's worst nightmare, and the only thing that prevents such runs is a sufficient level of public trust and confidence in banks, bank regulators and the banking system.

Trust between customer and bank is more easily established by the personal relationships and interactions that take place in multiple and routine face-to-face meetings within the context of traditional bricks-and-mortar banking. Knowing the teller, loan relationship officer or branch manager establishes a bond of trust between the institution and the customer. Even when researching, or applying online to, an institution that maintains a physical presence, it is being done with the knowledge that the person can always contact a human being in a branch if there is a problem, if further explanation is required or if more detailed questions need to be answered. In a bank that is a 'pure play' – an internet bank with no physical presence – this trust is harder to establish as the customer knows he or she cannot show up at the bank's place of business and have a face-to-face meeting.

This last point leads to another characteristic of the public's use of bank internet sites. Although many may use the internet for research purposes and may have formed a tentative opinion about which credit or deposit product is best for them, they appear still to crave human interaction with a bank representative to answer questions, explain pertinent provisions and, in essence, validate their initial decision. This need for validation from bank personnel who are regarded by customers as experts in their field is rein-

forced by the view that the average person finds banking products to be complex, not only in terms of the specific features of the product, but also because of the 'legalese' language of the documentation that often accompanies bank products and services.

Although many internet sites aspire to connect customers to humans by offering instant chat features – wherein typed messages can be exchanged – or even video links, it is unknown if these interactions will evoke the same level of trust and confidence as the face-to-face meetings afforded by bricks-and-mortar bank branches.



Reading 1.3

Brett *et al* (2014) *Bricks and Clicks*. Deloitte.

Please read Deloitte Analytics' *Bricks and Clicks* (2014).



When you have finished the article, write brief notes on the following question.

- How are banks integrating internet banking into their business model and determining when a physical branch may be profitable?
-

1.1.4 'Bricks and clicks'

Banks have realised that the internet has given them tremendous scope to reach new customers at reasonable marketing expense, and to permit disparate customers to effect financial transactions on one platform efficiently and at low cost to both customer and provider. However, as discussed previously, the factors of trust, validation and security motivate banks and customers alike to retain a traditional bricks-and-mortar presence where customers can have face-to-face meetings with bank personnel. Therefore, internet banking has emerged as another distribution channel for banking products and services and not a total replacement of the established bricks-and-mortar distribution.

Hence, the contemporary banking model embraces a 'bricks and clicks' approach which means that banks will deliver their products and services through physical bank branches as well as online on platforms accessible by computers, laptops, tablets and mobile devices. A bank's focus is to get the right 'mix' of distribution channels that delivers the best customer experience and profit.

This is not to say that bank branches are not embracing technology to assess profitability and drive sales. Branch managers use data to show customer account balances, whether the customer is profitable to the branch, and who in the branch is responsible for looking after the customer. The manager also can see if the branch is profitable overall. In this regard, the bank is seeking not only to reduce costs through technology but also to push up productivity by focusing on products and services which would be likely to interest a customer.

Some banks are turning branches into high-tech shops where assistants with tablets mingle with customers and help them with online applications or

product research. Others are turning branches into internet cafes or coffee shops where bank staff provide financial advice along with lattes. Video technology links branches to larger bank offices for customer queries which require more sophisticated advice than is available at the branch. In developing countries, shops are becoming banks: the retailer not only sells goods but also issues consumer loans to finance purchases, collects payments, and serves as a contact point where mobile phone payments are made or collected.

As long as bank customers require human interaction, it is most likely that there will be bricks-and-mortar banking. We still derive more satisfaction from dealing face-to-face when making very important financial decisions, resolving complaints, or needing assistance in navigating the financial marketplace. That said, branch banks will continue to employ technology to drive customers and sales as well as to reduce costs by automating as much of the transaction-processing part of the business as possible.

In a testimonial to the endurance of physical branches, Deloitte Analytics, a unit of the multinational accounting firm Deloitte LLP, reported in 2014 that 72% of consumers still go to the high street to access banking and financial services (Brett *et al*, 2014: p. 7).

Nevertheless, banks are approaching penetration of their services differently. In April 2018, JP Morgan Chase Bank announced that it would expand its products and services into the Washington, DC area with 70 new bank branches while at the same time promising to invest US\$ 1.4 billion in new money on technology and human talent. However, at the same time, Umpqua Bank with US\$ 25 billion in assets serving the US Pacific Northwest announced that it would consolidate 70 branches. In the UK, the Campaign for Community Banking Services reported that 2,153 bank and building society branches closed between the years 2004 and 2014.

In this regard, Deloitte suggests that banks must take a more granular approach to the delivery of their products and services and, in the context of the UK market, concludes that there are seven types of micro-markets whose demographics should dictate how banks deliver their services (Brett *et al*, 2014: p. 21). One of the interesting conclusions is that high-value customers (*ie* single, young skilled workers with significant earnings in urban areas and both young and mature families within the commuter belt) value convenience almost above all else. So a physical bank branch at or near a major commuter hub, with extended opening hours and knowledgeable personnel who can quickly answer questions, effect transactions and cross-sell additional products, could be highly effective and profitable.

1.1.5 Bringing the unbanked into the formal banking system

The spread of mobile telephony and mobile internet services has brought hundreds of millions of people into the formal financial system as digital money has become a normalised method of exchange which is regulated by central banks. According to the financial inclusion index (Findex) published by the World Bank (nd accessed 2019), 78% of the world's unbanked adults

receiving wages in cash now have a mobile phone, which not only provides them with the opportunity to enter the formal banking system, but increasingly causes banks to view them as an attractive commercial market. In China, Findex estimates that 225 million have no bank account but 85% of the same cohort have mobile phones.

However, traditional banks, some of which may have a quasi-monopoly on the formal banking sector in their jurisdiction, may be wary of venturing into this 'subprime' market. On the other hand, mobile network operators have provided the structure for mobile payments and, if traditional banks do not respond, fintechs – some of which make payments using Quick Response (QR) codes – will fill the void.

In addition to advances in mobile telephony, advances in electronic identity systems and widespread availability of cloud computing have facilitated inclusion into the banking systems of those who were previously excluded. Many of the previously unbanked were illiterate and often had no official papers or other means to verify their identity. Now, biometric systems are sufficiently inexpensive for banks to acquire them to facilitate financial transactions.

Access to cloud computing has permitted large amounts of financial transactions to be automated and completed in milliseconds. The application of artificial intelligence to unfathomable quantities of data has permitted a large number of ordinary credit decisions and money transfers to be made without human intervention. Greater automation of routine transactions lowers operational costs and makes it possible for banks to profit from dealing in smaller transaction amounts.

Is cash dead? McKinsey, a consulting firm, estimates that the country with the highest percentage of digital payment transactions is Norway, but 17% of transactions are still conducted in cash (Long, 2018: p. 7). However, use of near field communications technology allowing for 'contactless' debit card payments for small value items may continue to erode the use of cash.

Mobile payments systems may be just the beginning. Banks are exploring offering life insurance and crop insurance via mobile phones, either directly or in conjunction with fintechs. Data recorded by mobile phones may be mined by banks and non-depository lenders to determine a credit score such as where you shop, what you buy and how much you spend; whether you go to work regularly; your social media habits and posts; and where you go for your news. This trend, however, causes concerns over privacy and losing control of personal data (see Unit 8).

1.2 Digital Products and Services



Readings 1.4 and 1.5

Please read G. Philip Rutledge's 'The migration to online lending and rise of private regulation of online financial transactions with business customers' and Deloitte Center for Financial Services' *2018 Banking Outlook*.



When you have finished the articles, write brief notes on the following question.

- What types of products and services are banks providing on their digital platforms and what issues are facing banks as they adopt a more strategically focused and technologically modernised business model?

Rutledge (2016) 'The migration to online lending and rise of private regulation of online financial transactions with business customers'. *Financial Stability Review*, 20 (April), 93–100.

Deloitte Centre for Financial Services (2017a) *2018 Banking Outlook*.

1.2.1 Internet and mobile banking

Almost universally, banks now offer their services on a 24/7 basis via the internet on platforms accessible by computers, laptops, tablets or mobile devices. According to the Deloitte Center for Financial Services, in 2015 the weekly number of mobile banking customers surpassed the number of customers making weekly visits to a physical bank branch (Deloitte Center for Financial Services, 2016: p. 12).

Some commentators have grouped banking products and services into three different levels based upon the sophistication of the transaction.

Basic products and services usually revolve around personal finance and include personal current and savings accounts, account management (eg inter-account transfers), and online tools to check balances and whether cheques have cleared. These features are designed to permit customers to avoid visiting branches and queuing for the services of a teller.

Intermediate products include the basic products but add bill paying services, requests to stop payments, standing payment orders outside of bill payments, mobile deposits, credit card applications, certificate of deposit (bank-issued bonds in the UK) applications, consumer and mortgage loan applications and insurance (credit, life or auto) applications. However, it is worth noting that online bill paying services and mobile deposit have probably come to be regarded as basic rather than intermediate products, as they have become universally accepted with companies continuously urging customers to pay online and 'skip the postage stamp'.

Advanced products and services would include the foregoing as well as foreign currency exchange, corporate cash management, merchant services for point of sale (POS) transactions (including VISA® or MasterCard® debit and credit cards), letter of credit management, sale of mutual funds (unit trusts in the UK), share dealing and making governmental tax payments.

1.2.2 Treasury management services

Corporate treasurers were early adopters of internet banking. Most modern corporations of any size, including many small and medium size enterprises (SMEs), conduct their online banking business through a treasury management system offered by their banking institution. Treasury management offers a suite of services that allow the corporate treasurer to manage deposits and payables efficiently. Deposit services may include remote deposit capture, lockbox collection, sweep accounts and US Automated Clearing-house (ACH) credits. Payment services include positive pay, ACH debits, wire transfers and payment on credit extended by the bank.

In addition to basic online banking services, many banks offer businesses a suite of additional services which are accessible entirely online. These may include such features as a loan sweep service, investment sweep service, zero balance account service, ACH payment service, wire transfer service, and remote deposit capture service.

A loan sweep service allows a bank to set up automatic electronic payments with respect to a credit facility extended by the bank to the business if collected funds in a certain account exceed a set target amount, and to make automatic electronic withdrawals from the credit facility if the balance of collected funds in the account is below the target amount. An investment sweep account permits a business to sweep funds in amounts over a set target amount into overnight money market deposit accounts to earn higher interest on larger balances of collected funds.

A zero balance account service allows businesses to zero out their operating accounts each day and sweep the funds into other accounts in order to maximise cash management. As previously indicated, ACH payment services permit the business to establish a schedule of prearranged payments and deposits, as well as routine payments.

Positive pay is a service whereby the customer instructs the bank to make payments only on specific checks issued on the customer's accounts, for which the customer has provided identifying information to the bank.

Each of these services is generally subject to detailed contractual provisions separate from the terms and conditions applicable to the account. These address minimum technology specifications, mandatory security procedures, transaction timelines, fees, and liability provisions. These requirements may vary depending on the size and complexity of the business user as well as that of the financial institution providing the services.

Many of these online services require interfacing with third-party service providers that provide – in whole or in part – services to the bank which in turn allow the bank to offer them to their business customers. In this regard, it is important for the customer to understand and acknowledge that interruptions in service caused by third-party service providers could occur, and that confidential financial data will be shared by the bank with third-party

service providers in order to effect the customer's online transactions. (See Unit 8.)

1.2.3 Digital wallets

Digital wallets are intended to facilitate how we shop and perhaps how we bank. Most consumers are comfortable with debit cards which initiate electronic payment directives at the point of sale (the shop till) to the customer's bank to debit his or her current account in favour of the merchant. While some banks charge for this service, many others do not. The service is not free but is generally subsidised by the low rates offered on current accounts or other deposit products.

Digital wallets take the debit card to the next level. Instead of having one card, your smartphone can store several debit or card cards, retailer loyalty cards and details of your bank accounts or online payment account, such as PayPal in the US. The wallet may also analyse your data to determine the most cost-effective way to pay for an item: shop card (to get a bonus on offer for loyalty points); credit card (because it carries a low interest rate); or debit card (because there is no perceived advantage in not paying directly from your current account).

The US Federal Reserve System, which serves as the US central bank, has classified digital or mobile wallets into the following categories: (1) near-field communication (NFC) wallets; (2) cloud-based, card-on-file wallets; (3) cloud-based, card-on-file card network wallets; and (4) merchant or financial institutions QR code-based wallets. NFC wallets are contactless payment mechanisms whereby payments are made when a smartphone is held near a payment terminal and authentication occurs before the information is sent from the phone to the terminal. Some limitations to NFC wallets are that they can only accept eligible and wallet-accepted credit and debit cards, they can only be used in conjunction with a NFC-enabled terminal, and they can only be used with a compatible smartphone operating system.

Cloud-based, card-on-file wallets are used primarily for online e-commerce payments. These services allow a consumer to use multiple funding methods (eg credit card, debit card, prepaid card) for input into the mobile wallet. The consumer may pay for goods using any funding mechanism of their choice that is contained in the wallet. Cloud-based, card-on-file network wallets function similarly but without the need for merchants to store and collect payment data; rather, the card networks themselves work directly with the merchant to allow digital wallets to be enabled on their website or app.

QR code-based wallets use QR codes to complete payment with information that is stored in an app. These wallets, however, can only be used in their own environments; payments are effected using a QR code generated by a specific financial institution's or merchant's app.

1.3 Data Aggregators and Payment Systems



Reading 1.6

Please read Open Banking Ltd's *Background to Open Banking* (2018).

Open Banking (2018)
Background to Open Banking.



When you have finished the article, write brief notes on the following question.

- What is the origin of open banking? How does it operate and how does it affect the business of banking?

1.3.1 Data aggregators

Consumers of financial products now have access to data aggregation of their various accounts through a desktop, laptop or mobile device, which improves their ability to make financial decisions. Comparison software can compare terms and conditions of various credit and debit accounts; finance applications can assist with automatic savings, budgeting advice, loan decisions, and fraud and identity theft.

Consumer financial data aggregators necessarily involve consumers, financial services firms, data aggregators and consumer financial technology (fintech) application providers. Obviously, consumers are the users of financial products and services and they decide which applications to use in order to: (1) access their personal data; (2) give consent to such access; and (3) provide necessary authentication information.

Data aggregators are firms that access, aggregate, share and store consumer financial account and transaction data acquired through connections to financial services companies. Aggregators connect the fintech applications that consumers use to access their data and the source of that data which resides with financial services companies. An aggregator may be an independent provider of data to consumer fintech application providers, or it may be part of a company providing branded services direct to consumers.

The consumer fintech application providers are firms that access consumer financial account and transaction data, either from a data aggregator or a financial services company, in order to provide value-added information or services to the consumer. As with many applications, these services are accessed by consumers through websites or mobile apps created by these firms. Fintech application providers also may have direct links to financial services companies to provide a direct service to the company's customers, access payment systems on behalf of the customer, or facilitate a credit origination benefitting the customer.

How do data aggregators access customers' financial information? Initially, access was through 'screen scraping' but application programming interfaces (API) are becoming more prevalent as they are seen as more secure. In screen scraping, a customer provides account login credentials (user name

and password) to the aggregator who then accesses the customer's accounts to 'scrape' the customer's financial account and transactional data in order to process a request.

APIs, on the other hand, are specific programs that link two or more systems and enable a well-defined communication and data exchange between them in order to run applications and other software. An API is not a specific technology but rather a technology-enabled protocol allowing a computer system at a financial services company to interact with, or be used by, other software. Unlike screen scraping, a financial services company will knowingly participate in an API arrangement and can include custom features which it believes are appropriate, not only for increased security, but also for the management and presentation of any data within its control. The customer's consent is provided to the financial services company or at the API access point rather than giving a data aggregator a user name and password to access customer data through the website of the financial services company.

APIs are flexible: they can be open or restricted. In an open API, any third-party data aggregator or consumer fintech application provider can gain access to customer data and build consumer-facing applications. In a restricted API, there is an exclusive arrangement between the financial services company and the data aggregator or the fintech application provider.

An issue of concern with the use of APIs is that data aggregators may be able to access significantly more personal financial and transaction data than is necessary to execute the specific transactions requested by the customer, even though the customer may be under the illusion that the data aggregator has accessed only the information necessary to execute the transaction. This raises issues of data privacy. For example, could a data aggregator use its access to personal financial data to create data analytics, even on an anonymous basis, which it could then offer for sale?

Another issue is liability for unauthorised access. This is more troubling under a screen scrape scenario, as access is gained through a user name and password which can be obtained fraudulently or through malware – and by which funds can be transferred out of the account. Although the customer would expect compensation from the financial institution, would it be legally liable for such loss?

With respect to APIs, liability may rest upon the exact relationship between the financial institution and the API. For example, if a financial institution engages an API and provides it as a service to its customers, the API would be viewed in the same way as any other third-party service provider and the financial institution must engage in due care when selecting the API. If, however, a data aggregator enters into an API agreement with a financial institution and is providing a service not to the financial institution but to the financial institution's customers, it is more likely that the financial institution may want to include provisions within that agreement addressing who has liability in the case of unauthorised access.

1.3.2 Payment systems

Payment systems have spawned a revolution in the way people pay for small-value items, such as a coffee, sandwich, magazine or newspaper, taxi or local transport. Debit card issuers have moved to contactless cards which alleviate the need to swipe or insert into terminals to pay for items under a certain value. This reflects point of sale payments wherein companies provide physical payment solutions for bricks-and-mortar businesses.

Other types of payment-oriented providers include companies that: (1) provide solutions to secure transactions, authenticate users and detect and prevent fraud; (2) allow businesses to send money abroad; and (3) are centred around payment issuers / acquirers and the infrastructure enabling payments.

Payment systems in the US

In the US, the four primary core payment systems that transfer value between financial institutions are: (1) credit card networks; (2) debit card networks; (3) automated clearinghouse (ACH) transfers; and (4) wire transfer services. Additional components include non-bank payment processors, payment service providers and money transmitters. The latter category is considered in the US to be a money services business; such businesses are subject to very strict anti-money laundering regulations and they are supervised and examined by each state where they hold a license. Money transmitters that otherwise are not US banks, foreign banks or firms registered with the US Securities and Exchange Commission, or the Commodity Futures Trading Commission, must register with FinCen, the division of the US Treasury Department which serves as the US financial intelligence unit.

The core payment systems exist to move money between financial institutions and their customer accounts and therefore only regulated financial institutions have access to the payment infrastructure. Account-to-account transfers by US consumers have been the province of ACH credits and debits (as either one-time or recurring transactions) or wire transfers.

However, new peer-to-peer (P2P) technologies, whereby consumers can use their smart phones and tablets to instantly send money from their account to that of someone else, are being layered on top of existing payments systems. Whereas ACH transactions can be recalled in case of error, P2P transfers generally are immediate and the risk of sending money to the wrong person lies with the sender, not the bank, as the bank's responsibility is limited to following the customer's directions.

Consumer peer-to-peer payments have become more prevalent in the US as banks are partnering with Zelle (which is owned by several of the largest banks in the US) or participating with a third-party platform such as Venmo (which is owned by Paypal). These real-time applications permit consumers to securely and easily send or receive funds within minutes using the recipient's email address or mobile phone number.

However, these payment applications are not without risks to users. For instance, scammers can pay for physical goods with stolen credit cards or

hacked accounts and, when the payments company reverses the transaction, the seller is left without both the goods and the money. Scammers may also specifically ask a purchaser to pay for smaller value items such as mobile phones or concert tickets using a payment system, only to disappear after the funds have been transferred.

Since money is transferred based on an email address or mobile phone number, typing in the wrong address or phone number can result in money being transferred to the wrong person.

In all these circumstances, users are not reimbursed by the payment system because they authorised the transaction. Some users may believe that since Venmo is backed by major US banks, these banks will make reparations if they are the victims of a fraud. This is not the case.

Although the US is contemplating requiring banks to open up their application programming interfaces (APIs) to third-party providers, the UK has already adopted the Open Banking standard as part of the European Union's Second Payments Services Directive. Hence, the UK's Open Banking programme is significantly more advanced than anything on offer in the US; this may be due to the UK having significantly fewer banks and a smaller banking population than the US.

UK Open Banking

Open Banking in the UK is standardising the APIs used by banks to make payments and access information. APIs allow different software applications to talk to each other. If you order, track and pay for a taxi using an app, the taxi company, your bank and your GPS app use different software – but the APIs working in the background allow them to share information which, of course, boosts the efficiency and desirability of each one.

From January 2018, all company apps and websites in the UK will be able to talk to banks using a common approach whereby regulated companies will be able to make payments directly from your bank account after explicit consent has been given.

Under Open Banking, consumers and small- and medium-size enterprises (SMEs) can authorise a bank to make their banking data available to other companies in a standardised, secure and straightforward manner. Initially, consumers will be able to: (1) view and analyse fixed payments and variable / discretionary spending; (2) view all accounts in one place; and (3) implement debt management tools such as overdraft alerts and recommendations for products with lower interest rates or lower overdraft charges. For SMEs, Open Banking will help with cash flow management and obtaining better terms for unsecured loans. In time, companies will no doubt design and make available further applications which, using the data flow permitted by Open Banking, will benefit personal consumers and SMEs.

Although banks generally are hesitant about sharing customer data, many banks are burdened with a jumble of systems, platforms, software and tools, many of which are legacy in nature and demand significant resources.

Therefore, to create value with minimal disruption, banks may find it more attractive to source new banking applications from third-party vendors rather than integrating them into existing systems. This also may mean that banks need to discontinue proprietary products that they use as loss leaders in favour of products which enjoy price advantage due to economies of scale and name recognition.

1.4 The Rise of Fintechs



Reading 1.7

Please read the Deloitte Centre for Financial Services' *Fintech by the Numbers* (2017b).



When you have finished the article, write brief notes on the following question

- What are the broad categories of fintechs and in what ways have they altered the way financial services are being delivered?
-

Deloitte Center for
Financial Services
(2017b) *Fintech by the
Numbers: Incumbents,
Startups, Investors Adapt
to Maturing Ecosystems.*

Financial technology companies (fintechs) can perhaps be divided into three broad categories. One category consists of those companies that offer and deliver a distinct product or service exclusively in a web-based environment on a variety of platforms (mobile, social media, etc). Another category consists of companies that develop applications which are made available on third-party platforms and which the third parties believe will enhance the utility and value of their brand and drive business to them. The third category consists of companies that process data from source and apply computer analytics, including artificial intelligence, to the data to identify consumer trends and marketing opportunities which can be marketed to commercial enterprises.

Many fintechs have focused on banking and capital markets, investment management, personal insurance and real estate. Fintechs often break down tasks within each of these categories for development of further products and services.

For example, fintechs have divided banking and capital markets into subcategories that address banking infrastructure (including API integration and data analytics), lending, equity financing and crowdfunding, personal finance and SME tools and payment transactions.

Investment management includes companies providing information services that allow investors to compare investment options and risks in order to make better investment decisions. It also includes companies that assist institutional wealth managers, hedge fund managers and professional traders to better analyse and manage their portfolios.

Insurance has been hugely affected by fintech applications which help consumers and SMEs to review, compare, and buy automobile, property, casualty, health, disability and other types of insurance online, as well as allowing them to use mobile apps to file claims and track the claims process.

P2P insurance permits a group of policyholders to pay jointly for insurance on property which they jointly own, share or rent such as a house, boat, vacation home, *etc.* With respect to auto insurance, mobile metrics can be installed on a customer's vehicle to detect and record driving habits which may result in lower insurance premiums, or rebates. Data gathering and intelligence can assist insurance underwriters in assessing risk based upon a customer's claims history, credit score, or social media profile.

All facets of real estate have been transformed by fintechs. Nothing has changed the purchase of a home as much as fintechs which aggregate customer preferences concerning number of rooms, location and price to identify available homes offered by various real estate companies; and then provide estimates of closing costs, monthly mortgage payments and taxes. Buyers can request email alerts for new property listings fitting their profile. Sellers get instant feedback by email from prospective buyers after a house viewing.

Fintechs generally require significant investment of venture capital to develop a commercially viable product. The availability of this capital from seasoned entrepreneurs who gained experience in developing disruptive technologies, particularly from Silicon Valley in the US, was vital to the rise of fintechs. However, a 2017 report by the Deloitte Center for Financial Services notes that, while venture capital remains the primary source of funding for fintech startups, trends suggest an increasing level of private equity and debt financing from later funding rounds (Deloitte Center for Financial Services, 2017b). Deloitte suggests that these tend to be indicators of a maturing market and that fintechs may have entered a stage of shakeout and consolidation, as is often the case with emerging industries.

According to Deloitte, the largest sources of fintech investment have been the US and China and their amounts of investment have been approximately equal (Deloitte Center for Financial Services, 2017b: p. 12). However, since 1998 in the US, 264 fintech companies received investments of US\$ 7.71 billion; in China, US\$ 6.92 billion was distributed between just seven fintechs. Otherwise, the focus of fintechs on deposits and lending, investment management, personal insurance and real estate have been similar.

1.5 Fintechs and Banking

Although there is no dispute that the rise of fintechs has affected banks and the services and products they provide in an online environment, it is important to remember that fintechs generally are not banks which take deposits.

Many banks have elected to partner with fintechs that can deliver products to customers more efficiently, and at a lower cost, than if the bank used its own personnel. For example, SunTrust Banks, a regional bank serving states in the southern US, recently reported partnering with several fintechs to provide a digital mortgage application and an application for point-of-sale financing for heating, ventilation and air-conditioning systems. The following narrative exemplifies two traditional banking products that have been significantly affected by fintechs.

1.5.1 Consumer mortgages

One of the first significant manifestations of fintech was technological innovation related to obtaining individual mortgage and small business loans from non-depository lenders.

Non-depository lenders were early adopters of technology to offer consumers home mortgages through consumer-friendly internet applications. They promised fast decisions on mortgage applications without the need to visit the local bank branch, sit through a mortgage loan interview, and thereafter wait days for the bank's mortgage underwriting department to determine if the consumer qualified for the mortgage.

However, there is an important distinction between loans made by non-depository institutions and those made by banks which usually accept consumer deposits. Both are subject to supervision by applicable federal or state banking authorities and both must comply with certain consumer protection laws but non-depository institutions are not subject to the minimum capital, loan classification, mortgage suitability and other regulatory requirements that apply to depository institutions. Funding for loans made by depository institutions comes from customer deposits, whereas funding for loans made by non-depository institutions comes from private capital.

As a result of consumer mortgage lending activities during the Great Recession, depository institutions incurred significant costs, not only by misjudging the creditworthiness of consumer borrowers and their ability to repay their loans, but also from defending class action litigation and paying significant fines to federal banking regulators for alleged breaches of regulatory requirements. Also, the Dodd–Frank Wall Street Reform and Consumer Protection Act of 2010 ('Dodd–Frank') adopted in the US in the aftermath of the Great Recession has imposed a mortgage suitability obligation on deposit-taking institutions: they must have a reasonable belief that the consumer is able to repay the loan under the terms and conditions of the mortgage. In this regard, Dodd–Frank introduced a 'qualified mortgage'

wherein it would be presumed that banks met this suitability obligation if the consumer qualified for such mortgage product.

In light of the above, many depository institutions in the US have curtailed their consumer mortgage lending activities, particularly with respect to consumers who may not meet the requirements for a 'qualified mortgage'. Now, non-depository lenders can compete with banks not only on ease of application and speed of decisions, but also with respect to servicing those consumers who cannot meet the requirements to obtain a 'qualified mortgage'. It has been reported that, in the US, 42% of all home mortgages issued in 2014 were issued by non-depository lenders, up from 10% in 2009 (Koren, 2015).

1.5.2 Loans to SMEs

Perhaps even more importantly than consumer mortgages, fintechs have significantly altered how SMEs obtain financing – whether it be related to assignment of receivables, acquiring inventory, or establishing a physical or online presence. In this regard, computer power and data analytics have combined to acquire and process huge amounts of data which are filtered through algorithms to render decision points to which pre-determined terms apply: maturity, maximum loan amount, minimum monthly payments, interest rate, *etc.* Some fintech non-depository lenders targeting SMEs have advertised that they can render a loan quote within minutes after submission of an online application, rather than days.

Since SMEs are not viewed as consumers for personal, family and household purposes, many consumer protection provisions do not apply to them, even if the owner of the business, which may be a start-up, is inexperienced in financial matters and may pose a credit risk that a depository institution might find unacceptable.

Depository institutions find it hard to compete with non-depository lenders due to the additional regulatory regimes to which they are subjected because of their deposit-taking activities, as well as the relatively small amounts involved in SME loans (*eg* under US\$ 250,000). Even where a depository institution can compete on interest rates, a SME may be willing to accept a higher interest rate in exchange for the speed a fintech can offer with respect to a loan decision and funding of that loan.

Because of this, some large banks have been investing in fintechs which specialise in SME lending. In essence, banks are outsourcing this loan function by providing capital to fintechs in return for sharing in the profits they make from loans to SMEs. It has been reported that JP Morgan Chase Bank provided capital to OnDeck, a US fintech that focuses on SME loans of US\$ 250,000 or less (*The Economist*, 2015: p. 74).

The monetary policy of low interest rates which was followed by the US, UK and EU central banks after the Great Recession resulted in a large amount of capital seeking higher returns. This provided fintechs with not only venture capital to create applications but also, in the context of fintechs offering loans to SMEs, the capital to fund those loans. In the rising interest rate

environment introduced by the US central bank in 2017 and continuing in 2018, it is possible that investors will reallocate capital away from fintechs engaged in non-depository lending to SMEs to higher-yielding investments; this will curtail the amount of capital available to fund these loans and may result in industry consolidation.

1.6 Millennials and the Business of Banking



Reading 1.8

Please read Deloitte University Press' *First Impressions Count* by Srinivas *et al* (2017)



When you have finished the article, write brief notes on the following question

- What do millennials want from their banks and how is this affecting the delivery of banking services to this cohort?

Srinivas et al (2017) First Impressions Count: Improving the Account Opening Process for Millennials and Digital Banking Customers.

Much has been written about how the behaviours and expectations of millennials will affect the future of banking. In 2017, the Deloitte Center for Financial Services undertook a survey of how millennials viewed their banking experience in the account opening process, most millennials' initial interaction with a bank (Srinivas *et al*, 2017).

According to this survey, millennials want three things: (1) speed; (2) clear and concise instructions; and (3) follow-up by the bank as to whether they have any questions and are satisfied with the account opening process. Importantly, the survey found that consumers who thought the account opening process needed improvement were less likely to purchase other products or services offered by the bank, and were less enthusiastic about recommending the bank to others. Those who believed that the account opening process needed improvement had often opened their accounts through a mobile application. These instances suggest that the account opening software was not sufficiently mobile compatible.

In terms of the speed of account opening, the survey found that those millennials who encountered longer processing times (45–60 minutes) were five times more likely to state that the account opening process needed improvement than those who experienced shorter processing times. The survey noted that this association between slow speed and demand for improvement also applied to consumer loan and wealth management accounts.

The second most important issue for millennials was the clarity and conciseness of instructions. While a bank may not be able immediately to address issues relating to speed, which may be governed by the bank's third-party service provider, it can immediately review whether its account opening instructions can be improved. Although cross-selling is a universal focus of a bank's online presence, the survey concluded that those who were the target of a cross-sell attempt during the account opening process were more likely

to be of the opinion that the account opening process needed improvement. This may indicate that a cross-sell attempt should not be timed to occur during the account opening process.

The third most important issue was follow-up by the bank after the account opening exercise. The survey found that a lack of follow-up created greater dissatisfaction among those viewing the account opening process as needing improvement. Crucially, these customers also had to initiate follow-up with the institution at a rate that was higher than many other consumers.

Succinctly, the survey revealed that millennials want banks to provide clear and concise instructions that will result in speedy account opening via a mobile device, followed by a 'high touch' outreach by the bank to assess their satisfaction with the process.

1.7 Banks and Big Data

Banks may have more information on their customers than any other industry, and governments have given them an edge in this regard. Due to 'know your customer' and customer identification requirements, as well as new US FinCen rules requiring identification of the owners of legal entities (*eg* corporations, limited partnerships, limited liability companies), banks are required to collect an immense amount of personal data on their customers.

In addition to government-mandated information, banks also collect information concerning products in which a customer has expressed interest – current accounts, money market accounts, overdraft protection, insurance, mortgages, home equity loans, wealth management – by, for example, tracking entries in their website's search function. Where a customer uses branded debit and credit cards and participates in bank loyalty programmes, banks can mine data related to his or her vendor preferences, spending habits, monthly income and debt balances. Even tax status and insurability may be inferred based upon payments made to tax authorities and premiums paid to insurers.

If customers also interact with apps (credit and debit card applications, loan applications, bill pay, P2P payments, *etc*) on the bank's platform, or provide feedback on the bank's website, the bank can gauge the level of acceptance and usefulness of those applications. This is important to software developers so that they can design applications with the highest probability of being used by the most customers and therefore, of being profitable to the bank.

With all this rather granular consumer data at their disposal, banks are uniquely positioned to provide valuable advice on consumer trends to all types of physical and online merchants, application developers and data analytics firms. Looking at data flows, both from the product level and the location where the data is accessed (*eg* computer, mobile or tablet), may become more important and more valuable than providing snapshots of individual customer transactions.

The value proposition for the bank with respect to the monetisation of this data may not necessarily be an outright sale or lease of data, but partnering with fintechs. In return for access to the data, fintechs may develop applications which, based on the data, may be expected to drive more business to the bank and therefore, be made available to customers on the bank's platform. Due to legacy IT systems at banks and concern over data security, banks may engage fintechs to manage and secure their data, in exchange for access to the data.

Although banks are rich in customer data, the challenge will be to optimise the data to provide the greatest benefit for the bank and its customers without compromising data security and privacy. Issues of security and privacy, of course, have become even more important since the EU's General Data and Protection Regulation (GDPR) which came into force in May 2018 in the EU member jurisdictions (see Unit 8).

1.8 AI and Banking

Artificial intelligence (AI) uses machine learning to crunch vast amounts of data to identify patterns and make predictions without being specifically programmed to do so. As previously indicated, banks already have a treasure trove of personal customer data and, therefore, are better positioned than most to mine these data using AI.

AI may be used to determine which product recommendations receive the most positive response or to forecast demand for certain products. However, AI is not simply about letting a computer loose on a bunch of data. The data must be thoroughly prepared; algorithms must be intensively monitored and there needs to be a lot of customisation to render the output commercially useful.

Also, AI today is basically a pattern recognition tool, which means that it can be used to filter large amounts of data so that humans can concentrate on those situations which are most likely to have a positive outcome with respect to the task at hand. AI does not possess the intuition that a human gains from years of experience in evaluating human behaviour or the historical evolution of banking products or regulatory requirements.

Two areas where AI is expected to assist banks are customer interface and security. When interviewing a customer online for a loan, facial recognition could be used to predict whether someone is being truthful when being asked about income or repayment obligations. Loan officers could be prompted by AI if they have omitted to give a required regulatory disclosure or to highlight a particular feature of the loan being discussed. Bots could be created to automatically answer specific customer service questions based upon transcripts of previous customer service interactions. With respect to security, voiceprint technology may be able to determine if another person is trying to impersonate a customer.

In future, customers may interface with banks to effect transactions through digital assistants such as Alexa by Amazon or Google Assistant, and banks

need to be prepared to accept instructions from digital assistants as well as using them to provide recommendations on other available products and services which may be suitable based upon the customer's transaction history.

1.9 Cryptocurrencies

The term 'cryptocurrency' has been applied to Bitcoin, Ethereum and other 'coins' which are intended to be an online version of cash, outside the control of governments and banks. Economists generally have defined 'currency' to mean something that can be used simultaneously as a medium of exchange, a store of value and a unit of account.

Cryptocurrencies do not appear to meet these criteria. First, they are not widely accepted by merchants. In 2017, Bloomberg, a financial news service, quoted an analyst note from Morgan Stanley, an investment bank, that only three of the top 500 online retailers accepted Bitcoin, the most recognised cryptocurrency (Katz, 2017).

Second, the store of value is volatile and can be reduced to zero. A US dollar will always be worth one US dollar. The US dollar value of a 'coin' will vary daily. Deadcoin.com, a website that keeps track of abandoned 'coins', lists about 900 that have been abandoned by their creators or users.

Lastly, no one uses a cryptocurrency as a unit of account. Financial records may be kept in US dollars, UK sterling or Euros, but not Bitcoin. Therefore, these 'coins' appear to be more a means of speculation than a currency.

A newer genre of coin called 'stable coins' has sought to address the issue of volatility by backing the coins with physical assets such as gold or fiat currency, a basket of other cryptocurrencies, or by increasing or decreasing the supply of coins available. To date, these efforts do not appear to have erased or eased the volatility factor, perhaps due in part to users not universally believing that such collateral exists.

Underlying these coins is a blockchain technology which records all transactions among the system's users rather than in a central authority. The distributive nature of blockchain makes it slow and cumbersome by comparison to other technologies, because all transactions must be broadcast to everyone on the network so that they can update their local copies of the blockchain. When two parties intend to enter into a transaction, they must alert everyone else of their intention. The proposed transactions are aggregated into blocks by a subset of users called 'miners' who are responsible for maintaining the books and records of the blockchain to ensure its integrity. Every block is connected to its predecessor by a chain of cryptographic links; this makes it almost impossible to alter records once entered into the blockchain. Thus, there is no ability to 'unwind' transactions.

The 'miners', who are essential to the operation of the blockchain, are paid in coins. Therefore, the availability of miners is proportional to the value of

the coins. If the payment coin loses value, there is less incentive to become a miner for transactions in that coin.

Where do users store their coins? Many coin exchanges also provide a web-based custody feature which will store coins purchased on the exchange. As an alternative, there are several different types of digital wallets which can be accessed through the internet. However, any wallet that requires internet connectivity is susceptible to hacking and theft of the cryptocurrencies stored in the wallet. In the case of mobile devices, laptops and USB sticks, the physical loss of the device could result in the theft of the cryptocurrencies stored therein.

As will be discussed in Unit 5 with respect to initial coin offerings, cryptocurrencies are more akin to an investment product. In a survey reported in its 2018 Equity Gilt Study, Barclays, a large UK financial institution, reported that most people who purchase Bitcoin are doing so for investment purposes.

References

- Brett L, H Lewis, S Soral and N May (2014) *Bricks and Clicks*. [Online]. London: Deloitte LLP.
- Deloitte Center for Financial Services (2016) *Disaggregating fintech: Brighter Shades of Disruption*. [Online]. Available from: <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/financial-services/us-fsi-disaggregating-fintech-brighter-shades-of-disruption.pdf> [Accessed 3 April 2019]
- Deloitte Center for Financial Services (2017a) *2018 Banking Outlook*. [Online]. Available from: https://www2.deloitte.com/content/dam/Deloitte/ie/Documents/FinancialServices/IE_FS_Banking_outlook_2018.pdf [Accessed 12 February 2019]
- Deloitte Center for Financial Services (2017b) *Fintech by the Numbers: Incumbents, Startups, Investors Adapt to Maturing Ecosystem*. [Online]. Available from: <https://www2.deloitte.com/content/dam/Deloitte/ru/Documents/financial-services/fintech-by-the-numbers.pdf> [Accessed 12 February 2019]
- DeYoung R (2001) 'The financial performance of pure play Internet banks'. *Economic Perspectives – Federal Reserve Bank of Chicago*, 25 (1), 60–75.
- Katz L (2017) *Bitcoin Acceptance among Retailers is Low and Getting Lower*. [Online]. Bloomberg, 12 July. Available from: <https://www.bloomberg.com/news/articles/2017-07-12/bitcoin-acceptance-among-retailers-is-low-and-getting-lower> [Accessed 3 April 2019]
- Koren JR (2015) 'After subprime collapse, nonbank lenders again dominate riskier mortgages'. [Online]. *Los Angeles Times*, 30 November. Available from: <https://www.latimes.com/business/la-fi-nonbank-lenders-20151130-story.html> [Accessed 3 April 2019]

Long S (2018) 'Financial inclusion is making great strides'. Exclusive Access. Special Report: Financial Inclusion. *The Economist*, 5 May.

Open Banking (2018) *Background to Open Banking*. [Online]. London: Open Banking Ltd.

Rutledge GP (2016) 'The migration to online lending and rise of private regulation of online financial transactions with business customers'. *Financial Stability Review*, 20 (April), 93–102.

Singhal S (2003) 'Scrambled eggs, clipped wings and yet a reason to smile?'. In: *Internet Banking: The Second Wave*. New Delhi: Tata McGraw Hill Education. pp. 3–48.

Srinivas V, S Fromhart and U Goradia (2017) *First Impressions Count: Improving the Account Opening Process for Millennials and Digital Banking Customers*. Centre for Financial Services: Deloitte University Press.

statista (nd) *Number of Internet Users Worldwide from 2005 to 2018 (in Millions)*. [Online]. Statista: The Statistical Portal. Available from: <https://www.statista.com/statistics/273018/number-of-internet-users-worldwide/> [Accessed 2 April 2019]

The Economist (2015) 'Banking and fintech. Love and war: An unlikely romance blossoms'. [Online]. *The Economist*, 5 December. Available from: <https://www.economist.com/finance-and-economics/2015/12/05/love-and-war> [Accessed 3 April 2019]

US Department of the Treasury (2018) *A Financial System that Creates Economic Opportunities: Nonbank Financials Fintech and Innovation*. US Department of the Treasury. Available from: <https://home.treasury.gov/sites/default/files/2018-07/A-Financial-System-that-Creates-Economic-Opportunities---Nonbank-Financi....pdf> [Accessed 2 April 2019]

World Bank (nd) *The Global Findex Database 2017*. [Online]. Available from: <https://globalfindex.worldbank.org/> [Accessed 12 February 2019]