

Technology and innovation in the insurance sector



TECHNOLOGY AND INNOVATION IN THE INSURANCE SECTOR



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Foreword

“Insurtech” is the term being used to describe the new technologies with the potential to bring innovation to the insurance sector and impact the regulatory practices of insurance markets. This report catalogues these technologies and examines how InsurTech is being funded and how insurers are engaging with the start-ups entering the market.

This report was prepared as part of the programme of work of the OECD Insurance and Private Pensions Committee, the international forum for addressing policy and regulatory issues in insurance and private pensions for governments, international organisations and industry. It has benefited from input from the insurance market and industry, including from a number of insurance start-ups. This report contributes to the OECD’s Going Digital project which is examining from a wide range of perspectives how technology and innovation is affecting the economy.

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Executive summary

Innovation through new technologies is a key driver of change in the financial sector and this has led to immeasurable efficiency gains, even though these changes can initially be accompanied by uncertainty and doubt. The insurance sector is no exception to such developments, with possibilities of new methods of service provision as well as greater opportunities for data collection and fraud detection that can lead to better risk identification and mitigation measures, which are being referred to as “InsurTech”.

This report catalogues the relevant technologies that are being viewed as having the potential to bring innovation to the insurance sector. How InsurTech is being funded is examined, as this indicates which markets are actively investing in start-ups and how insurers are engaging with start-ups. Case studies are made of insurance start-ups, and how blockchain technology, sharing economy, robo-advice and data aggregation are influencing the insurance sector is discussed. The manner in which insurers engage technology to ensure better compliance with regulation is also examined.

Innovation and new technologies have the potential to affect the franchise value of insurance companies, with accompanying competition policy considerations. Policies which have tailored coverage and simplified claims processes can improve coverage to segments of society that hitherto were not able to access financial protection. Regulatory approaches, such as the regulatory sandbox being developed by a number of jurisdictions, may bridge greater competition and prudential requirements, although ensuring a level playing field as solutions graduate into the full market require some consideration.

There are a number of areas in which greater regulatory discussion should take place, as the transparency of the technology and the impact on policyholder’s choice and rights may not be clear. Data protection is an area that will require closer examination by regulators, as the volume of personal data handled by insurers increases, whether consensus was gained for the intended use becomes blurred. Data aggregation brings forth the possibility of certain segment of the population becoming uninsurable, so how data is harnessed should be closely considered. The treatment of algorithms is also an area for further discussion to ensure that the assumptions built in are appropriate and unintended consequences are avoided in so far as possible, and regulators have a means of engaging in this assessment. These could have implications on the ongoing monitoring of operational risk and internal control of insurers. Ensuring that policyholders are fairly treated and appropriately protected when the implications of certain innovations and technologies are uncertain will be important going forward.

As emerging markets have less of an established distribution network of insurance, innovation and technology may have the greatest impact in such markets. Nevertheless, whether developed or emerging, appropriate regulatory monitoring should be carried out to ensure that the welfare of policyholders is safeguarded.

There are number of ways in which regulatory approaches could be considered for InsurTech, but as well in the wider FinTech realm. The OECD is engaging with FinTech issues in a number of ways, and further areas of discussion are proposed. This report is part of a wider project by the OECD on FinTech developments, as well as the OECD horizontal project on Seizing the Benefits of Digitalisation for Growth and Well-Being.

1. Introduction

Innovation through new technologies is a key driver of change in the financial sector and this has led to immeasurable efficiency gains, even though these changes can initially be accompanied by uncertainty and doubt. In recent years, such innovation has happened on the back of new technological developments, with the phenomenon often being described as “FinTech”. As financial services deal in intangible products, it is well suited for technological innovation to lower transaction costs and expedite the delivery of services. Although this has, in fact, been happening over the history of finance, the recent proliferation of internet connections, home computing and mobile devices, and the development of applications has led to the possibility of lowering the barrier for market entry, paving the way for greater competition in or “disruption” of the financial industry. However, slating technological and innovation as “disruptive” technology can be misleading, and it is likely to be more a hindsight observation than the everyday trial and error that accompanies innovation and technological advances.

The insurance sector is not an exception to this, with developments in technology leading to possibilities of new methods of service provision as well as greater opportunities for data collection that can lead to better risk identification and mitigation measures, which are being referred to as “InsurTech”. InsurTech, as compared to FinTech, is more often related to service improvements for individuals, as opposed to businesses.

Innovation is generally regarded as a positive development, delivering convenience and efficiency. For example, the advent of cash points (ATMs) assisted people to gain access to cash even out of business hours and lowered the costs for banks. Improvements in communication networks and processing capacity have led to faster payment processes. Insurance claims can be processed via online platforms, with less time for processing. Comparative sites permit product comparison of various insurance products.

How the insurance sector responds to economical and society-wide technological innovations, and provides insurance processes and policies that integrate such changes would be an important development to consider. For example, the sharing economy has made start-ups, such as Uber, making available ridesharing more conveniently and widely. While commercial motor liability insurance would be a requirement for taxi drivers, Uber drivers may not have the appropriate coverage as it is often their side business or a part-time job. Insurance companies are already responding to this specific case, but it presents a wider question of how insurance responds to new risks that do not fit the traditional lifestyle and/or economic activity of individuals or businesses.

Given that underwriting is largely based on the analysis of historical data to carry out the risk assessment of a policyholder, insurance, on first glance, appears particularly well suited for “big data” analysis. Big data and blockchain have been major topics in many insurance discourses of technology.

InsurTech has attracted large venture capital investments, and the trend of financing indicates that many start-ups are considered by investors to be commercially viable on a

mass-scaled basis. Insurers themselves are making strategic investments in insurance start-ups, allowing them to have a stake in these developments while providing the capital for such enterprises to develop their business.

A number of insurance start-ups such as Friendsurance, Lemonade and Policygenius have attracted large investments. To comprehend how disruption may be happening in the insurance sector, case studies of start-ups are presented throughout this report, to provide context, and better understand how such businesses are being developed and how they are different from traditional business models.

There are new forms of processes that may be improving the efficiency of intermediation and claims management. Most insurance start-ups involved in distribution have sites with well-developed contents, often accompanied by the application of artificial intelligence or robo-advice. These are intended to give an improved customer experience and lower commission/fees for when products are sold, although the initial fixed cost will likely be higher. Some outlooks predict the number of insurance employees will drop as a result of some of these evolutions (McKinsey, 2015).

This report examines the various innovations taking place in the insurance sector, and what policy and regulatory impact they may have, as well as the benefits that could be reaped from innovation in the insurance sector, especially for policyholders. There are regulatory and competition considerations that need to be made as “disruption” to the industry is often about new market entries as well as new modes of service provision which may not fit the mode in which regulations was conceived upon. There are also wider privacy and data protection issues which require close attention given that InsurTech by nature usually involves a digital component to the technology.

This report is part of a wider project of the OECD to examine FinTech developments, as well as the OECD horizontal project on Seizing the Benefits of Digitalisation for Growth and Well-Being (see Box 1).

Box 1. OECD Work on FinTech

As part of an OECD-wide project presented at the June 2016 Ministerial meeting on Digitalisation of the Economy and Society, various OECD bodies have been, and will be, covering this area from a wide range of perspectives, ranging from the impact on traditional financial firms and payment systems to issues related to competition, and financial consumer protection and literacy. The OECD's Going Digital project (www.oecd.org/going-digital/) was officially launched on 12 January 2017 at a conference organised jointly by the OECD and the German Federal Ministry of Economic Affairs and Energy in Berlin. The conference brought together a wide range of stakeholders to discuss some of the most pressing policy challenges related to the digital transformation. This conference served to inform the Going Digital project and to kick-off the German G20 Presidency's digital agenda.

In October 2015, OECD Competition Committee held a Hearing on Disruptive Innovation in the Financial Sector. The hearing focused on the example of peer-to-peer lending, equity crowd-funding, digital currencies, and payment mechanisms, and was based on the premise that innovators are needed to contest markets, stimulate competition and enhance productivity, especially in financial services where network effects can create natural monopolies, concentrate rents and render financial services expensive and exclusive. The hearing explored such issues, assessed the impact of selected financial innovations on consumers, and discussed how existing regulatory frameworks can be changed to encourage the introduction of new business models and technologies – and not stifle them at too early a stage.

The OECD/International Network on Financial Education also undertook work on the implications of digitalisation for financial literacy and relevant aspects of financial consumer protection. The G20/OECD/INFE report “Ensuring Financial Education and Consumer Protection for All in the Digital Age” was submitted to the G20 presidency in April 2017.

The OECD contributed to the development of the G20 High-level Principles on Digital Financial Inclusion, endorsed by G20 Leaders in September 2016.

The OECD Insurance and Private Pensions Committee (IPPC) held a Roundtable on Technology and Innovation in the Insurance Sector in June 2016. Participants approved a project outlining the implications of technology and innovation for the insurance sector. As part of its work on robo-advice, the IPPC organised a Roundtable on Robo-Advice in retirement saving in June 2017 to discuss better understanding how these types of platforms operate from a regulatory/supervisory perspective.

2. Funding of InsurTech¹

Funding for new technology and innovation in the insurance sector are impacted by the wider venture capital (VC) possibilities in the market. In the United States, InsurTechs have benefited from a rich and competitive market place for VC funding, and many insurance start-ups have successfully completed a number of funding rounds. On the other hand, some markets do not have a strong VC culture, so the approach to raising capital would be different, with public sources becoming more important. For example, the French start-up, InsPeer, has funding from a number of public sources.

Box 2. Technology relevant to InsurTech

A number of wider technological developments and innovations underpin many of InsurTech developments. Some of the technologies are inter-related and a brief review of them is useful in establishing a common understanding of their nature.

Mobile technology and applications (apps)

The network effect of mobile phones and development of applications for these devices (“apps”) has allowed many companies to reach a bigger audience than was previously possible. Mobile technology may be working in different ways for InsurTech, depending on the generation of mobile networks available, and the types of handsets that are most widely used.

Smartphones and internet access enable innovations which are based on the use of apps. For this, mobile networks that allow short messages and pre-paid mobile phones, as well as large data transfers would be necessary. This is particularly relevant to emerging markets which have low insurance penetration and do not have a well-established distribution network. As in the example of BIMA (Box 7), mobile phones have the ability to notify individuals via SMS on anything from the insurance coverage to reminding them of imminent withdrawal of airtime for premium payments.

Artificial intelligence (AI), algorithms and robo-advice

AI is intelligence exhibited by machines. A machine would be considered “intelligent” when it takes into consideration its environment and takes action to maximise the possibility of achieving its given goal. It is widely used when computer programmes are developed to have cognitive functions such as learning and problem solving. AI research is taking place in fields including reasoning, knowledge, planning, learning, natural language processing, perception and moving/manipulating objects.

¹ This section draws heavily on data from CB Insights which is the leading data and information provider on private company investment.

Box 2. Technology relevant to InsurTech (cont.)

Algorithms are part of AI, where there is a set of steps for a computer programme to achieve a task under certain conditions. Well known algorithms include route navigation systems or computer chess games. In the financial sector, algorithmic trading, such as high frequency trading, is wide spread, with pre-programmed trading instructions to execute large trading orders. The algorithm would follow a set of conditional instructions for placing a trade order at a speed and frequency that is not possible for a human trader.

Robo-advice, or automated advice, is becoming prominent particularly for online investment and savings platforms. It can cover a broad spectrum of services, but is essentially an “on-line automated advice model that ha[s] the ability to deliver advice in a more cost-efficient way” (HM Treasury and FCA, 2016). For the insurance sector, robo-advice is being developed for investment management and is now being increasingly used for quotes with automated advice and offerings calculated through algorithms. Instead of or combined with face-to-face advice, robo-advice can provide automated guidance and execution on various financial decisions. Automated advice could assist pockets of population that do not have access to financial advice to gain input in a more cost efficient way than a human advisor. However, depending on how the algorithm to provide advice is structured, it could also lead to inappropriate advice being made inadvertently.

Smart contracts

“Smart contract” refers to any contract which is capable of executing or enforcing itself. They are written as programming code which can be run on a computer or a network of computers rather than in legal language on a printed document. This code can define strict rules and consequences that emulate a traditional legal document, stating the obligations, benefits and penalties due to either party being in various circumstances. Smart contracts enable people to trade and do business with strangers, usually using the internet, without the need for a large centralised authority site to act as an intermediary. The limitation of a smart contract is that a programme may not know what is happening in the physical world or react to unforeseen events, thus being unable to execute an action that was the basis of the contract.

Smart contracts often run on blockchains or distributed ledger technology (DLT). Example of a smart contract using DLT is a cryptocurrency, such as Bitcoin. Ethereum is one of the largest platforms for smart contracts and blockchains.

Blockchain/distributed ledgers technology (DLT)

Blockchain or distributed ledger technology (DLT) is a protocol for the exchange of values or data over the internet which does not require an intermediary. The protocol of blockchain technology is to create a shared, encrypted database of transactions and other information. Examples of ants and flocks of geese have been given to demonstrate what a perfect blockchain society would be like; decentralised yet coordinated.

The technology is to establish an ever-lengthening chain of blocks of data. Each block has compact record of validated transaction by participants in the blockchain, and the premise of blockchain is that the information in the blocks is true. Once the transaction is validated and recorded, the stored record is irreversible. Blockchain originally referred to the database where all Bitcoin transactions are recorded and stored.

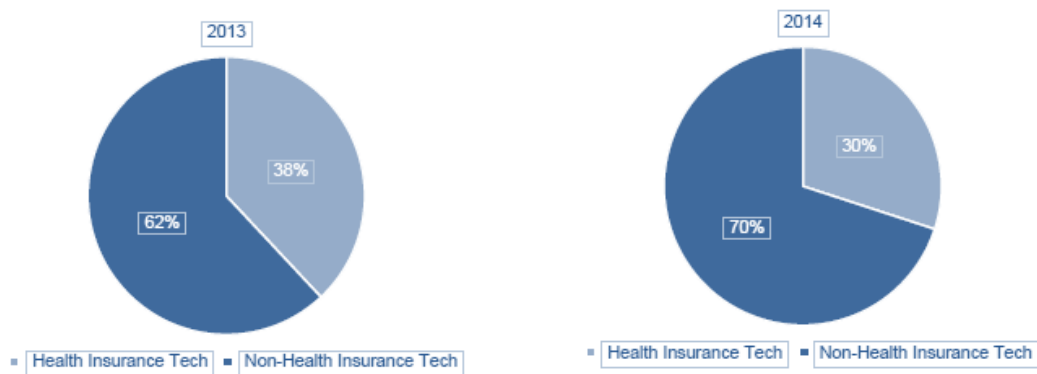
Figure 1. InsurTech financing trend (2011-2016)



Source: CB Insights (2017a) *Insurance Tech Start-ups Raise \$1.7B Across 173 Deals in 2016*
www.cbinsights.com/blog/2016-insurance-tech-funding/.

2015 saw record funding levels for InsurTech, with funding estimated to be USD 2 669 billion in total. The 2016 Q3 saw funding levels of USD 1 401 billion, and the number of deals in 2016 Q3 were 126, already exceeding the number of deals in 2015 (see Figure 1). It should be noted that in 2015, nearly 1/3 of funding went to Zhong An, a Chinese internet-only insurer that was established in 2013 with backing from Alibaba Group Holding, which raised USD 931 million in 2015, and is said to be planning a IPO.

Figure 2. InsurTech deal activity by focus area in the United States (health vs non-health)



Source: CB Insights (2017b), *InsurTech Connect 2016* (October) <https://www.cbinsights.com/reports/ITC-insurance-tech-deck.pdf>.

In 2016, 59% of InsurTech deals went to US-based start-ups, followed by Germany (6%), UK (5%), China (5%) and India (3%) (CB Insights, 2017a). This may not perfectly match the population of InsurTechs, but is indicative of the VC possibilities in the market, in particular for the US, although Asian InsurTech is much weaker compared to the wider VC funding in the region. The number of VCs that are investing in InsurTech start-ups has increased from 55 funds in 2012, to 141 in 2016 YTD (CB Insights, 2017b).

While the breakdown of the investment in the insurance sector is not available, investment in health insurance is considered to be strong and growing, taking up 70% of InsurTech investments in the United States (CB Insights, 2017b). At the same time, investment in start-ups providing commercial distribution avenues has increased many

folds, indicating the strong interest and the number of start-ups hoping to improve the customer experience.

Life and annuity start-ups are attracting large investments, as are health and dental insurance start-ups (CB Insights). Auto insurance distribution/comparison start-ups also constitute a large cohort of the insurance start-ups.

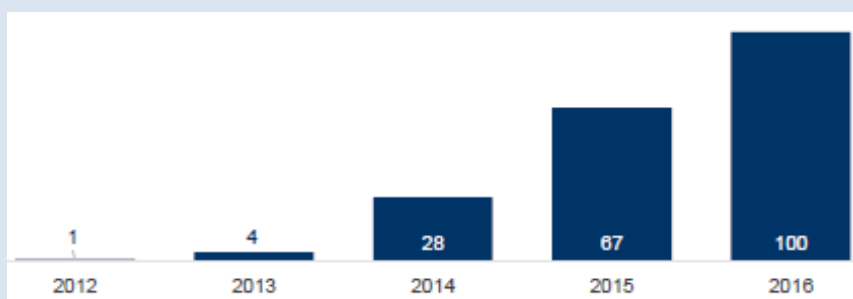
In addition, insurers are providing funding structures that would allow them to have first pick of successful new technology and innovation that could support their existing operations and improve the customer experience. This has been via both general VC funding opportunities and targeted InsurTech investments, as well as establishing incubators that host InsurTech entrepreneurs and employees (see Box 3). A number of insurers have provided investment to InsurTech start-ups, as well as Internet of Things (IoT) start-ups.

Box 3. Funding of InsurTech by (re)insurers

The wider funding landscape for InsurTech is described above, but a more interesting development has been how (re)insurers are funding InsurTech. Some of the larger insurers have set up specific funds and VCs to invest in start-ups, including for InsurTech, indicating the likelihood of greater investment into InsurTech, and the strategic investments existing insurers will make to ensure they have a stake in a start-up that may be able to scale their business.

The number of deals made by (re)insurers in 2016 was 100 deals, compared to 67 in 2015 and 28 in 2014) (CB Insights, 2017c).

Figure 3. Tech start-up investment by (re)insurers (2012-2016)



Source: CB Insights (2017c), Where Insurers and Reinsurers Invested in Tech Start-ups in 2016 www.cbinsights.com/blog/2016-insurance-cvc-total/

Reflecting the wider InsurTech landscape but with certain specific differences, US (re)insurers are making the majority of investments in InsurTech with 64% of deals being made (as opposed to the actual funding level, for which data is not available)(CB Insight, 2017c). Most likely reflecting investments that Ping An Insurance has made in Zhong An, and Taipang Insurance has made in Alibaba Health, Chinese (re)insurance investments is 10% of deals made by (re)insurers. It may be that given the lower penetration of insurance in China, it is being anticipated that the market may develop based on the new intermediation models that are being introduced in China. France and UK (re)insurers make respectively 11% and 6% of deals by (re)insurers (CB Insight, 2017c).

Many of the deals are made by (re)insurers' strategic VC arm. Ping An Venture has been making some of the largest investments in InsurTech with over 20 deals. Axa Strategic Ventures has also completed 20 deals and together with Ping An have been the most active in deal making of strategic investments.

Box 3. Funding of InsurTech by (re)insurers (cont.)

US-based insurers MassMutual Venture, USAA, American Family Ventures, Transamerica and New York Life follow with between five and ten deals each. After which, the European insurers Allianz Ventures, MunichRE/HSB Ventures and Aviva Ventures continue.

More historically, Axa Strategic Ventures, Transamerica Ventures and American Family Ventures have been the most active investors in private tech investing since the start of 2012. Axa provided seed funding for five European start-ups under a fund set up in France in 2013, before launching Axa Strategic Ventures in 2015. The €200 million (USD223.47 million) venture capital fund has a mandate to invest in innovations in insurance, asset management, financial technology and healthcare services. Axa created Kamet in 2015, which is a €100 million InsurTech incubator working with both internal and external entrepreneurs. Axa recently invested €75m to take an 8% stake in e-commerce company Africa Internet Group and has become the exclusive insurance provider through Jumia and other platforms.

Allianz established Allianz Ventures as its centre for investments in and partnerships with start-ups to target five key areas: InsurTech and wealth management; mobility and connected cars; connected homes and properties; digital health; and cyber security and data intelligence. Recent investments include a minority stake in digital wealth manager MoneyFarm. Allianz X is the group's "company builder" that identifies, builds and scales new business models in InsurTech and related areas like blockchain and artificial intelligence.

Aviva launched a venture capital arm to invest in new digital businesses late 2015, based in Hoxton Square, the hub of London's digital entrepreneurs, with an annual fund of approximately £20 million (USD24.8 million) to be invested over the next five years. Its first investment was in Cocoon, a smart home security device that alerts householders to movement and sound within their property. In May 2016, Aviva announced a partnership with Founders Factory, a digital accelerator and incubator, becoming its exclusive financial services partner over the next five years, providing capital and resources to support the growth of more than 200 technology businesses.

Munich Re has made investments through its HSB Ventures division in Slice Labs, a US provider of on-demand insurance, which launched a product for hosts of homesharing using platforms like Airbnb, HomeAway, OneFineStay and FlipKey. The insurance lasts specifically for the time the owner is acting as a business so they insured can buy cover only when they need it. Munich Re has secured the right to provide underwriting capital and insurance licensing for on-demand insurer Trov in the US market. Trov's app allows customers to insure individual items like electronics or sports equipment from their smartphone and gives them the facility to switch cover on and off when required.

In April 2016, smart sensor start-up Helium's USD20 million Series B was led by corporate venture arm GV, but Munich Re/HSB Ventures also participated. Helium's sensor technology lies in its ability to use off-the-shelf sensor and connect it to the Helium Cloud which allow the OS to control storage temperature. So thus the use of such technology can protect from liability arising, for example, from leaving the refrigerator open in a restaurant or a hospital not managing its vaccine stock.

Ping An Ventures has been actively investing in the healthcare sector.

Most of the (re)insurers on the have only been publicly investing in start-ups for the last two years and areas in which (re)insurers consider there to be mass demand and practical application to their businesses.

Axa Strategic Ventures, AIG, and American Family Ventures have investing in IoT start-ups in auto, home, industrial, and other segments, and Axa, AmFam, USAA, and MunichRe/HSB have made separate IoT investments as well.

3. Insurance intermediation and distribution models

Insurance intermediation has traditionally used either the agent/broker or bancassurance model. While this remains the main intermediation channel for most developed insurance markets, many InsurTech start-ups are taking on this model and proposing new distribution models for insurance. These new modes of distribution are in particular interesting for less developed insurance markets, where insurance penetration is low and the conventional intermediation model of agent/brokers may not be efficient or effective. Asia and Africa have witnessed large investments being made into start-ups and technology based in their region.

BIMA, Friendsurance, InsPeer and Guevara are all distribution-based insurance start-ups, providing new insurance services. While they do not intermediate policies in the more traditional sense, they all have brokering licenses to triage the appropriate policy using different business models. BIMA operates in less developed markets, and has had wide success in intermediating health insurance products through their model of combining agents with mobile platforms. BIMA has acquired a microinsurance license in some of the markets it operates. Friendsurance, InsPeer and Guevara are all peer-to-peer (p2p) insurance companies that rely on peer pressure for risk mitigation.

Box 4. BIMA

BIMA uses mobile technology to provide insurance services in developing and emerging markets, which the technology permits with the lower entry costs. In many developing countries, in Africa in particular, mobile phones are widely used for not only telecommunications, but also for accessing banking and payment services. The proliferation of mobile phones (penetration of 70% of population) and the acceptance of the technology for financial services have enabled BIMA to expand its health services in 16 markets. The success of this model has enabled BIMA to reach profitability in several markets already.

The main innovation of BIMA is the creation of a proprietary back-end tech platform which creates a mechanism for both registration and payment. Policyholders register using their handset to fill in some basic identification details which process takes approximately 2 minutes. Premium payment is collected via automatic deduction of prepaid airtime credit; unlocking a new payment channel that makes insurance affordable and accessible.

Distribution is carried out by a trained agent force. BIMA agents make the initial contact with potential policyholders, providing product education about all aspects of the policy including basics like the cost (just a few cents a day) and the coverage level. Post-sale, the customer will receive a confirmation SMS plus a monthly reminder of their coverage status and amount to be deducted.

BIMA sells a range of personal insurance products, including accident, life and hospitalisation cover (this policy pays a fixed amount per night spent in hospital). To claim, policyholders call customer support that will help them to file their claim which is paid in cash within 72 hours of the claim being completed.

Box 4. BIMA (cont.)

BIMA is primarily licensed as an insurance intermediary and/or a licensed microinsurance provider, where applicable, and not an underwriter. Data is stored in Sweden which data protection regulation would apply.

In total, BIMA has raised USD75 million in capital so far. In 2015, BIMA closed its series C funding round with USD38 million raised from existing investors, including Investment AB Kinnevik, LeapFrog Investments and Millicom. This builds on a successful B series funding of USD22 million and USD15 million of capital invested before these rounds.

Box 5. Friendsurance, InsPeer and Guevara

Friendsurance, InsPeer and Guevara are based on similar business models, although operating in different markets (namely, France, Germany and the United Kingdom).

Friendsurance

Friendsurance was launched in 2010 and has funding from a number of internet venture capitalists (Horizons Ventures, VantageFund, e.ventures, the German Start-ups Group as well as the European Regional Development Fund). They are licensed as insurance brokers in Germany. Friendsurance is considered a pioneer of “social” or “person-to-person” “peer-to-peer” (p2p) insurance, offering household, personal liability and legal expenses and car insurance. Policyholders with the same type of insurance form small groups, which could either be with friends or find a group on their site. A part of the group’s premiums are paid into a cashback pool. If no claims are submitted, the members of the group can get up to 40% of their premiums paid from the cashback pool at the end of the year. Claims are settled using the cashback pool, and thus the claims decrease the cash back amount at the end of the year. Large claims are covered by normal insurers, with whom the firm has partnerships.

The benefit of p2p insurance is that the network effect discourages the group from making claims for very small amounts and policyholders seek participation from friends to increase the size of the pool.

InsPeer

InsPeer was launched in 2015 in France, and is a p2p insurance scheme that enables a group of people to share their deductible when a claim is paid. InsPeer is backed by angel investors, Bpifrance, the City of Paris, and Region Ile de France.

As the higher the deductible, the lower premiums become, a policyholder can raise their deductibles and share the risk with the designated group of people. InsPeer provides services for auto, motorcycle, and homeowners insurance policies. Other than increasing the deductible, InsPeer does not require changes to insurance contracts.

Users form small groups which share the risk that one or all will file a claim. Users can participate in as many insurance groups as they like but their exposure is limited to €100 pledged to any one participant and €1 500 across the platform. The service is completely free if there are no claims. In the case of a claim, InsPeer keeps a 10% of the claim paid by the insurer.

To assist policyholder assess who to share their risks, a risk indicator has been developed that indicates the expected claims rate of one person. This risk indicator for consumers is expressed in years, for example 8.5 years means that there is a chance of paying a claim once every 8.5 years.

Box 5. Friendsurance, InsPeer and Guevara (cont.)**Guevara**

Guevara is a UK based insurer, and offers a choice of groups to join for auto insurance policyholders, to which their premium is split into one portion that is paid into the individual group (protection pool) and the rest into the single collective pot (insurance fees) that supports all of the individual groups. The split of premium is determined by the number of members in a group.

Claims are first paid from the protection pool until it is exhausted, after which claims are paid from the insurance fees. When the insurance fee is also exhausted and the combined ratio exceeds 100%, reinsurance is taken out. Any funds left in the protection pool remain in the pool the following year, and requires being topped up only, in addition to the annual insurance fees.

By using peer pressure, the objective is to keep claims low. Guevara is authorised as a peer-to-peer insurance provider by the FCA, and can operate as a broker.

The best known carrier model is Lemonade, which has acquired an insurance carrier license, and attracted one of the largest seed funds for an InsurTech start-up in 2016.

Box 6. Lemonade

Lemonade is one of the InsurTechs to have raised the largest amounts of seed funds, with a USD13 million seed round from venture capital Sequoia Capital and Aleph, as well as investments from XL Innovate, XL Catlin's venture capital arm. Lemonade Insurance Company is a property and casualty insurance company based in New York and with a New York state license as a full-stack insurance carrier.

Premiums are paid into a claims pool, and from that a fixed fee (20% of premiums) is taken out monthly for reinsurance coverage and expenses, with the remaining being used to pay claims. If the total of premiums paid is more than the fees and paid claims, moneys are returned to policyholders in the form of an annual 'Giveback'. Giveback is donated to charities of the policyholder's choice, and for this purpose virtual groups of 'peers' are formed around the charities of choice. Reinsurance is used to pay for claims that exceed the size of the pool.

Premiums are calculated individually for each policyholder and are based on a number of different factors including credit history, recent claims and information about the property including its age, size, and construction quality.

Lemonade has developed an AI app, Maya or Jim, to make the offer of an insurance policy. Risk mitigation factors such as sensitivity of homes to windstorms, severe weather damage, and fires are taken into account, and discounts made for protection equipment that may have been installed, such as fire and burglar alarms.

It has hired a renown behavioural scientist, Dan Ariely, as its Chief Behavioural Officer. Lemonade is a benefit corporation and a certified B-Corp, the only in the insurance industry, which is certified by the non-profit B Lab and must meet high standards of social and environmental performance, accountability and transparency. A benefit corporation is a for-profit corporation with a mission to achieve positive impact on society, workers, the community and the environment in addition to profit as its legally defined goals.

Lemonade's reinsurance partners are Everest Re, Hiscox-Lloyd's of London, XL Catlin-Lloyd's of London and Berkshire Hathaway's National Indemnity.

Finally, there is the self-governing model that often uses blockchains to auto execute the contract. There are potential benefits that could be reaped for risk transfer tools, such as cat bonds, which will be another area that blockchains are likely to further explore.

Blockchain is based on distributed computing, which results in a decentralised network. It is by design meant to avoid centralised control and is characterised by free participation. One of the advantages of blockchains in terms of financial transactions would be the improved cyber security due to its decentralised nature. Another is the transparency of transactions, which are all recorded in the node of the blockchain. Linked with this is that when a smart contract is part of the blockchain, there will be no need to authenticate the transaction, as it is effectively announced through its transparency and it is irreversible, which is another feature of the blockchain.

Blockchain technology could be applied to insurance services in a number of ways. InsurETH presents a case study (see Box 7), but if a blockchain can use external, third-party data sources, claims management could be automated potentially reducing the transaction cost. Para-metric insurance could benefit from such a process, especially for agriculture or disaster-related insurance for retail policyholders. Fraud detection could also be improved if blockchains were able to access data on purchase records, police reports, ownership etc.

The blockchain by nature does not permit amendments to transactions after the fact. This means that while for standard policies the technology could be a useful tool, for complex policies it may have limitations in its application. The legality of a blockchain-based contract is unclear, and thus its enforceability could be compromised as a result. As the policy would be written in the code of the blockchain, for regulatory and legal purposes an administrative step could become necessary for it to be transformed into a legal document, until the law recognises a blockchain as a legal document.

Box 7. The use of blockchains in insurance

Blockchains have the potential to change how transactions are processed, and this wave is coming to the insurance sector as well. Allianz Risk Transfer and ILS fund manager Nephilia Capital are piloting the use of blockchain smart contract technology for processing a natural catastrophe swap. The technology would process the transaction and settlement between insurers and investors.

The pilot demonstrates the technology has the possibility to simplify and accelerate contract management. Each validated contract on the open shared infrastructure contains data and self-executable codes inherent to that contract. When a triggering event occurs, meeting the agreed conditions, the blockchain smart contract picks up the predefined data sources of all participants, and then automatically activates and determines payout to or from contract parties.

Another similar initiative taking place between insurers and reinsurers is to explore the potential of distributed ledger to streamline paper work and reconciliations for (re-) insurance contracts and accelerate information and money flows, while greatly improving auditability. The B3i initiative is a cooperation between Aegon, Allianz, Munich Re, Swiss Re and Zurich, which will pilot the feasibility of using anonymised transaction information and anonymised quantitative data, in order to achieve a proof-of-concept for inter-group retrocessions by the use of the blockchain technology.

Box 7. The use of blockchains in insurance (cont.)

"Cat bond" payments between insurers and investors can take weeks or even months after the triggering event due to manual processing and authentication through intermediaries is not required. As blockchains cannot be altered, their characteristic assists in ensuring that ownership cannot be duplicated or forged.

A study forecasts that for the reinsurance industry, more efficient data processing and reductions in claims leakage and fraud through blockchain solutions could remove 15% to 25% of reinsurance expense ratios which are typically 5%-10% of premiums (PwC, 2016).

One of the promising example of insurance using blockchain is the start-up InsurETH. InsurETH uses one of the blockchain platforms, Ethereum. Ethereum is one of the most popular blockchain platforms which is public and has a smart contract functionality. InsurETH offers automated flight insurance which relies on Ethereum smart contracts, and recording premium payment in the Ethereum blockchain. Travel insurance policies often cover delay of flights or lost baggage, but policyholders are not often aware of this coverage and often only make claims for higher expense claims such as delays due to a medical emergency or to access medical benefits. This is in contrast to the flight delays and lost baggage being a much more frequent incident and one which can be tracked using third party data sources. InsurETH uses this advantage by selling flight insurance, and automatically sources proof for claims using a public data feed Oraclise. This automates the process, in that if a flight delay occurs claims are paid automatically based on the data feed information.

The simplification of the contracting, which is done by inputting the flight number and coverage amount, enables travellers to easily access the coverage. The payment is done through the deposit of Ether, although denominated primarily in pound sterling, which is the cryptocurrency of Ethereum. So the traveller would be required to create a Ether wallet which is also a simplify process using applications.

4. The sharing economy and insurance

The sharing or gig economy is becoming a larger part of the economy, as services such as ridesharing (Uber, Lyft, BlaBla Car) and homesharing like AirBnB become common and popular service platforms. As a commercial service, these services will be required to have insurance coverage for certain aspects of their business.

As part of this, there is strong recognition that millennials², which are one of the largest age cohorts in the United States and are entering their highest consumption period, have a preference for having digital solutions available for transactions (Goldman Sachs Global Investment Research, 2016), and this is also prompting insurers to review how to approach distribution and claim management. Millennials have a 10% less positive customer experience of insurance transaction than other age cohorts, which is indicative of the dissatisfaction felt by this generation to conventional insurance solutions (Capgemini Consulting, 2015).

One of the key features of millennials and the sharing economy is that complete strangers share their personal experience/review, car, house, quite freely, while confidence in established business processes, such as insurance, is considered less positive. From the distribution sites, robo-advice and data analytics discussion below, it could be that insurers can expect greater willingness by policyholders to provide more personal data and prefer computer generated advice. Insurer may have to adjust their business processes in accordance with such consumer behaviour and take greater care of privacy.

While the provision of insurance coverage for ridesharing services is improving, the nature of the service creates unique challenges to underwriting. Public transport and taxis require insurance coverage as commercial service providers which are excluded from standard auto insurance. Commercial coverage is based on the driver having certain qualification and experience transporting the public, and the vehicle being maintained to a certain standard on a periodic basis. Ridesharing typically uses drivers not authorised to drive taxis and their personal vehicles, although in some cases they are licensed drivers providing services in their spare time.³

Some insurers are addressing the unique nature of ridesharing. For example, Uber has coverage by separating the coverage to the core policy of when a driver has picked up a customer and dropped them off, lower coverage for when the driver is logged on to the system and waiting for a pick up and a separate coverage for physical damage to the driver's vehicle while it is being used for the rideshare services. There is still a potential gap of when a commercial coverage is in effect, and when the driver's personal auto insurance will be expected to cover any unplanned incidents.

² Millennials are generally referred to as those born between 1980 and 2000.

³ This has resulted in the service being banned in a number cities as a result of opposition from taxi unions.

Peer-to-peer homesharing, such as AirBnB, would likely require additional coverage as a homeowner policy would not cover liabilities caused by a renter. When renting out a home on a single occasion, it is likely that homeowner or renter's insurance will cover such an occasion, although it may require notification to the insurer in advance. However, for repeated homesharing/renting, an add-on to the policy or commercial insurance may be required, in particular to cover liability from guest damage. Monthly coverage is becoming available for such additional coverage by a number of insurers.

Beginning in January 2015, Airbnb began including no-extra-cost USD1 million "Host Protection Insurance" for hosts – and in some cases their landlords – designed to cover the liability associated with a peer-to-peer rental. Intentional acts that aren't the result of an accident are not covered by the insurance, as well as what the website terms "property issues," such as mold, bedbugs and asbestos.

5. Robo-advice and AI

While price comparison and distribution sites are becoming wide spread, much effort is being made to develop sites that provide financial guidance which is tailored to the policyholder's income and needs with greater automation through algorithms for products with investment and/or saving components. This could assist in narrowing the protection gap of the lower income population as the cost of such services is lowered.

Robo-advice capabilities can be largely categorised into (Accenture, 2015):

- Understanding client needs: gathering client information, understanding needs and preference, assessing risk tolerance, considering outside accounts;
- Proposing a policy: developing a financial plan, selecting asset allocation;
- Implementing the policy: opening accounts, transferring assets; and
- Monitoring and adjusting the policy: quarterly or annual performance reviews, dashboards and status alerts, market updates and research.

In comparison to robo-advice, human interaction has benefits in that long-term relations can nurture trust and understanding between a policyholder and financial advisor/broker/agent, in particular in times of financial difficulty. Financial advisors may be better at persuading policyholders to take certain actions. In addition, robo-advice has not been challenged in poor market conditions where assets lose value. How robo-advice might cope in such situations is unclear.

On the other hand, robo-advice has the ability of developing a financial plan addressing multiple goals, including retirement, protection needs, estate planning and health/long-term care coverage. Robo-advice has the privacy which some may feel more comfortable with given the sensitivity in discussing money matters.

What would be important for many policyholders is that the fee would be lower than financial advisors. In the investment advisory sector in the US, for example, financial advisers generally charge 1% of the assets under management as fees, this is opposed to the between 15 to 35 b.p. of assets under management charged by investment robo-advisors (Investor Junkie, 2016).⁴ In comparison, in the United Kingdom for example, Santander's branch-based investment advice fees are 2.5% of assets invested, with a minimum investment of £500 and a maximum of £150 000.

⁴ For example, Charles Schwab's robo-advisor does not charge a fee.

Box 8. Robo-advice for insurance

Robo-advice is primarily being applied for investment advisory, and thus far its use in the insurance sector is yet to be wide spread. However, some insurers are starting to provide robo-advice on insurance in conjunction with other financial services they provide.

LV=, the UK-based mutual financial services company that provides insurance as well as saving and investment products acquired a stake in Wealth Wizards in August 2015, to provide advice on retirement saving products. The platform is now being offered as Retirement Wizard in the LV= site, and is available to provide advice to those within three months of wanting to access their pension and have a pot size between £13 500 and £150 000. The advice would include annuities or income drawdown.

The Royal Bank of Scotland announced it was introducing robo advisory services for its clients, with face-to-face financial advice becoming available only for customers with £250 000 or more, but enabling clients with as little as £500 to access advice in March 2016. This has resulted in the cut of a large number of insurance product financial advisers, as the RBS would be providing financial planning including insurance.

In both cases, robo-advice takes advantage of the service provider having alternative investment products available not only in insurance. It is to be seen how the insurance market will further incorporate robo-advice into its business process.

Box 9. PolicyGenius

PolicyGenius was founded 2014 to provide users with price comparison information on life insurance, long-term disability insurance, renters insurance and pet insurance. As opposed to most insurance comparison sites, it is not based on a lead generator model, which interprets an inquiry as a request for a quote and sells the client inquiry to insurance brokers/agents who would then try and sell the policy. Also the user experience is considered a key factor of the business and contents is developed for an improved user experience and provides advice on the offers being made. They are not affiliated with any particular insurance company and their algorithms work to match the user with the best policy to fit their needs. It is licensed as an independent broker in New York state.

Life insurance is the company's most popular product, followed by disability insurance. Through its "insurance checkup tool" it analyses and generates the advice that is suited for the user.

It raised USD750 thousand in seed funding, and has raised USD5 million in a series A and \$15 million in a series B round of funding. Revolution Ventures led the Series B round, with previous investors including Karlin Ventures, Susa Ventures, Axa Strategic Ventures, Transamerica Ventures and MassMutual Ventures. PolicyGenius reached 800,000 users by the end of 2015 although whether the user inquiries led to actual policies is undisclosed.

AI is being used in a number of sites such as through the algorithm used by Lemonade for its policy offering and PolicyGenius (see Box 9). AI has the potential to simplify and tailor policy offerings to match the needs and financial situation of the policyholder. This

is different from robo-advice, where AI is specifically designed for personal advice, primarily on investments.

On the other hand, the algorithms are a blackbox, which in some instances could be leading to poor advice. A study indicates that for the majority of age groups, a combination of robo-advice and personal advice was deemed to be optimal (E*Trade Financial, 2016), which has generally been the way in which most insurer AI would be developing their robo-advice (Acord & Surely, 2016).

The underlying algorithm of robo-advice and AI are not transparent in most cases, and biases could be built in, both unintentionally and intentionally, leading to inappropriate advice. The understanding of how this impacts policyholder behaviour and how regulation should address this is unclear but an area that requires greater discussion (see Box 14).

6. Data aggregation and analytics

Internet, the Internet of Things (IoT), hand held devices, and applications are all contributing to the possibilities that technology can have in collecting more data from businesses and individuals. Social media as well as devices such as Fitbit and Apple watch permit device operators to collect individual activity data as well as health related data. While insurance has traditionally relied on quantitative data to make risk management decisions, data analytics goes beyond this remit and can be contentious in some occasions. Underwriting and claim management are particularly data rich, and insurers use data collected for fraud prevention, marketing, claims management and pricing risk.

For example, personal auto insurance in the past relied on internal data sources such as loss history. However, auto insurers have started to incorporate behaviour-based credit scores from credit bureaus into their analysis, based on empirical evidence that people who pay their bills on time are also safer drivers. There is an issue of risk awareness, as a US Government Accountability Office report in 2005 reported that 53% of respondents to a survey in the United States did not know this when they could request credit scores to be excluded for premium considerations in times of hardship (GAO, 2005).

Some insurers could/are engaging such data by having an arrangement with the data collector or purchasing the data from a data aggregator. As insurance depends on making an actuarial assessment of the risk, having more relevant data would assist the analysis. The release of previously unavailable or inaccessible public-sector data has greatly expanded potential sources of third-party data. The US and UK governments and the European Union have recently launched “open data” websites to make available massive amounts of government statistics, including health, education, worker-safety, and energy data, among others.

One example of such endeavour is the marriage of longevity data, face recognition technology with underwriting for the provision of life insurance. Face recognition technology is used to predict factors such as chronological age, gender, smoking habits and body mass index (BMI). Based on this data, and accompanied by an activity sensor, such a FitBit or physical activity tracker on a mobile phone, your expected life expectancy is provided. A term life offer is made based on this, and the term period can be selected by the policyholder.

Telematics and insurance is another avenue in which data analytics is being used to monitor the behaviour of policyholders and mitigate risks in advance as well as discounting premiums where applicable. Motor insurance related data has been abundantly accumulated in insurance companies as it is one of the largest lines in most countries. Telematics insurance is when a device is fitted into motor vehicles and used to track driving. For example, the Italian Insurance Association estimates that blackboxes have been installed in over 2 million cars in Italy, to support the provision of blackbox insurance, “telematics car insurance” or Usage Based Insurance (UBI), and is one of the large markets for telematics car insurance. Blackboxes devices track speed, braking,

acceleration, cornering and the time of the day a journey is made via satellite technology. The data is transmitted to the insurer by GPS which enables the insurer to estimate the likelihood of a claim being made. Such programmes benefit young drivers that do not have a track record to influence their premiums, for example. While there is no research that clearly indicates the link between telematics and accident rates (UK Transport Research Laboratory, 2015), anecdotal evidence suggests telematics solutions can reduce collisions by up to 20%, operating costs by up to 10%, and fuel consumption of between 8% and 11% (Zurich Fleet Intelligence, 2016). It is estimated that the number of consumer subscribers to telematics insurance is expected to grow to 142 million globally by 2023 (IHS Markit, 2016).

On a risk management level, there are a number of data analytic solutions that could assist insurers. These include integrated geospatial analytic tools, geo-spatial analysis, and data quality management tools and claims/exposure matching. In particular, claims processes could benefit from the use of pictures taken and filed via smartphones and concierge services to smooth the process.

If data aggregation is being used for actuarial purposes, it could lead to potentially too high premiums or uninsurability of certain segments of the society or individuals, or ethically questionable outcomes. If premium are risk-based, granularity of the data could have both a positive or negative impact. The negative impact would be when potential policyholders are not able to purchase insurance at a reasonable premium level when it is a risk-based premium (Keller & Hotte, 2015).

The Internet of Things (IoT) is when sensors and actuators embedded in physical objects—from roadways to pacemakers—are linked through wired and wireless networks, often using the same Internet Protocol (IP) that connects the Internet. The connection permits large volumes of data to flow to computers for analysis (McKinsey, 2010). Telematics insurance is the best known example of insurance using the IoT. Other examples of IoT devices being used for insurance are sensors in private homes, farms or businesses to alert policyholders about risks such as bad weather conditions and security surveillance, or to provide feedback about individual risks. Biometric data such as electrocardiogram (EKG) and arrhythmia detection, pulse and variability, blood pressure, respiration information, blood sugar level, muscle activity, sleep patterns, body temperature, blood oxygen levels, skin conductance levels, brain activity, hydration levels, posture, eye tracking data, ingestion and fertility information can also be generated and applied in data analysis for insurance purposes.

Having extremely granular data may have a number of unintended consequences. The most immediate would be the privacy of those who provide the data. While the data protection of data relevant to the contracting of an insurance policy is clear, the treatment of data collected additional or outside of this may not be. Tracking of data, whether by a blackbox device or an activity sensor, provides much data beyond what the insurer may require to determine the behaviour of the policyholder or the premium reductions. Insurers would not only have data on the driver's behaviour, but where they travel to and visit, and the frequency of this. While activity sensors permit a better understanding of a policyholder's lifestyle, genetics also account for a large part of a policyholder's health and life expectancy. It would become important that a distinction is drawn by insurers for when a poor lifestyle caused ill health, for example, and when a person is born with poor health which have no way of being addressed by lifestyle choices.

The ownership of data generated through the IoT, as with many digital devices, is still being discussed, and currently general privacy and data protection regulations would

apply. The US Federal Trade Commission issued a report in 2013 (FTC, 2015), examining some of the issues on the IoT and privacy. The manner in which IoT collects data makes it difficult to gain consent every time data is collected, and is not necessary either. However, it is important that a choice can be made by the individual before data is collected, although not in instances when the context of collecting data is consistent with the transaction the individual is entering with the company (FTC, 2012). Where the use of data would be inconsistent with the context of the interaction, a clear and conspicuous choice should be offered.

Box 10. Estonian Insurance Association's motor insurance database

Estonia's insurers developed a centralised online IT system for motor third-party liability (MTPL) insurance in 1998, which eventually transitioned in 2001 to all policies having to be concluded online and physical policies being prohibited. The database has information on all issued MTPL policies and all MTPL claims handled. This development was supported by the Law on MTPL which requires information to be provided to the MTPL database prior to the start of the contract, as well the claims information without delay (a 64 euro fine is applied for every erroneous entry). It thus has a statutory status, and the database is legally recognized with third parties.

The MTPL database is cross-referenced with other state registrars which ensures quality control of the database. As the database is open, the public can refer to it and monitor the information that has been entered.

The MTPL database also has a claim mapping function, which enables the aggregation of where incidents which has resulted in a claim have occurred. This information has been used by road planners to fix cross-sections that have resulted in many incidents.

Another issue is how cross-border data transfers should be treated. Data can be ubiquitous if structured, and can be used to analyse behaviour in other countries. This is discussed in detail in section 7.

7. The role of policy and regulation in InsurTech

Insurance regulation and innovation hubs

While innovations are generally a positive development, there are a number of potential policy and regulatory ramifications which can create some uncertainty and certain limitations in business developments. In terms of competition policy, the potential to have new entrants to the market through the application of innovations and new technologies could bring greater consumer utility. The rationale for competition law or policy is to improve the consumers' welfare and the efficiency in production and supply, which would lead to lower prices and wider choice. The possibility of new entrants in the form of start-ups and greater choice as a result of innovation and technology could bring a number of positive developments to competition in the insurance market.

When start-ups want to become an insurer or an insurance agent/broker, there are potentially prohibitive capital and/or fit and proper requirements that must be met to gain authorisation to operate. Perhaps for this reason, there are very few InsurTech start-ups that have gained insurance underwriting licenses, and most have broker licenses. While for prudential purposes these requirements are an important cornerstone to ensure policyholder protection, these could potentially be a barrier to new market entry, where applicable. There is constant tension in the financial sector on the appropriate balance between financial regulation and competition, and this is very much relevant in the context of innovative technology.

To address this, some financial regulators have established platforms to enable FinTech start-ups experiment with their technology and relaxing some of the regulatory requirements within the platform. The UK Financial Conduct Authority (FCA)'s Innovation Hub is one of the first applying the "regulatory sandbox" approach. Singapore's Monetary Authority of Singapore (MAS) has also adopted the regulatory sandbox approach. Australia's Securities and Investment Commission (ASIC) has established an Innovation Hub to mitigate risks by engaging early with FinTech innovators and helping new entrants understand the regulatory requirements. The Hong Kong Monetary Authority and Canada's Ontario Securities Commission have also launched similar platforms in recent months. These platforms are all designed to assist new market entries that would encourage greater competition and innovation in the market, ultimately benefiting consumers.

Box 11. Monetary Authority of Singapore's approach

The Monetary Authority of Singapore (MAS) has adopted the regulatory “sandbox” approach to FinTech, which is applicable to the Singapore financial sector. The approach that MAS has taken is to acknowledge that new technologies can increase efficiency, manage risks better, create new opportunities and improve people’s lives.

A regulatory sandbox approach is being proposed to carve out a safe and conducive space for Financial Institutions and FinTech players to experiment with FinTech solutions, while containing any consequences of failure. However, Financial Institutions are free to launch new solutions without MAS’ guidance if they are satisfied with their own due diligence and there is no breach of legal and regulatory requirements.

MAS carried out a public consultation in June/July 2016 and issued the finalised FinTech Regulatory Sandbox Guidelines in November 2016. The paragraphs below summarise some of the key points of their approach.

The regulatory sandbox approach would involve MAS’ support by relaxing specific legal and regulatory requirements prescribed by MAS for the duration of the sandbox. It would generally not be available to FinTech solutions that are:

- Similar to those already being offered in Singapore unless the applicant can show that either a different technology is being applied or the same technology is being applied differently, and
- When the applicant has not demonstrated that it has done its due diligence, including testing the proposed financial service in a laboratory environment and knowing the legal and regulatory requirements for deploying the proposed financial service.

There should also be an intention that the FinTech solution would eventually be deployed in Singapore after exiting from the sandbox.

MAS has identified requirements that should continue to be applied even to sandbox applicants, and those that could be relaxed. Requirements that will not be relaxed are related to customer information confidentiality, fit and proper criteria particularly on honesty and integrity, handling of customer’s moneys and assets by intermediaries, and prevention of money laundering and countering terrorism financing.

Source: MAS, FinTech Regulatory Sandbox Guidelines (November 2016).

Box 12. The UK Financial Conduct Authority's Project Innovate

The UK Financial Conduct Authority (FCA) launched Project Innovate in October 2014 to encourage innovation that would benefit customers, and promote competition through disruptive innovation. Project Innovate is led by the Innovation Hub which assists innovative business gain access to fast, frank feedback on the regulatory implications of their solutions, and identifies areas where the regulatory framework needs to adapt to enable further innovation in the interests of consumers.

Support through the Innovation Hub is based on an eligibility criteria that includes whether it is a genuine innovation, what would be the consumer benefit, has the business invested appropriately to understand the relevant regulations, and does the business have a genuine need for support from the Innovation Hub. The Innovation Hub has had over 600 requests for support and offered direct support to over 300 firms.

The FCA has also developed a Regulatory Sandbox. The objective of the regulatory sandbox is to create safe spaces in which businesses, both authorised and unauthorised, small and large, can experiment with innovative products, services, business models and delivery mechanisms without immediately incurring the normal regulatory consequences of engaging in the activity in question. Unauthorised firms are subject to a tailored authorisation process and must meet threshold requirements, but it grants them restricted authorisation to test their ideas. The restricted authorisation option is not available for a banking license. For authorised firms, the sandbox could provide clarity to applicable rules that do not easily fit into existing guidelines. Consumer benefits would be a prerequisite for applications to the sandbox.

The FCA has stated that it has accepted four applications from the insurance sector to develop towards testing.

The regulatory sandbox approach intentionally creates a space for insurance technology to be experimented in a different regulatory regime from the regular. Although it is early stages of the approaches, it would be worthwhile to understand when technologies are deemed successful and scalable, how they will be graduated into the regular regulatory framework. Going forward, this will be important in ensuring that a level playing field is applied at the appropriate stage.

A relevant development that is taking place between MAS, FCA and the Australian Securities and Investment Commission are bilateral cooperation agreements between the authorities that allow them to make referrals on innovative businesses seeking to enter each other's market. This would assist in enabling start-ups transfer their business models on a cross-border basis, assisting with the businesses to scale when the opportunity arises.

Another relevant consideration, for developing countries in particular, is whether there is merit in having a specific regulatory framework to allow new insurance products that target specific limited risks, that are low in value and may benefit from greater penetration of insurance policies while having a limited policyholder impact.⁵ To date, a

⁵ India's Insurance Regulatory and Development Authority adopted a regulation on microinsurance regulation in 2015.

number of countries (Brazil, India, Mexico, Pakistan, Peru, the Philippines, South Africa, and Taiwan and other African countries) have specific microinsurance regulation (Biener, Eling & Schmit, 2013). Microinsurance can also be beneficial in OECD countries, as the example of the start-up Trov demonstrates. Trov is on-demand insurance for your possessions, which can be switched on and off through a mobile device. The mobile app enables the value of the inventory of possessions to be tracked in real time and insurance premiums as well. With the lower transaction costs that mobile technology can bring, microinsurance may find a way to be more readily provided in developed insurance markets as well.

In the age of new technology, insurance regulations which will likely be affected are governance and market conduct related rules. The OECD Guidelines on Insurer Governance recommends that board members and key executives should establish internal controls that ensure compliance with applicable laws, regulation and standards, as well as an incentive structure that promotes the fair conduct towards consumers and policyholders. Controls functions are expected to assess the appropriateness of policies, processes and procedures, and identify and follow up on any deficiencies.

The IAIS' Insurance Core Principles (ICP) 19 states that requirements for conduct of business be made to ensure the fair treatment of customers, whether before, during or after the contract has been entered into. This should be based on insurers' ethical behaviour, acting in good faith and the prohibition of abusive practices. While new technologies and innovations may enable insurers to provide products that are appropriate to the needs of a customer, as stated in ICP 19.6, how to ensure the process is fair is uncertain.

If an insurer does adopt new technologies or innovates processes/products, it should consider whether the appropriate internal control considerations have been made, as well as being appropriate in terms of market conduct.

A number of countries are engaged in a wider discourse on, for example, autonomous cars, which will have an impact on auto insurance coverage. The recent fatality resulting from a self-driving car in the United States (see Box 13) has brought to the attention the reality of autonomous cars and how to ensure their safety. Together with this, how the liability of such a car in an accident has yet to be fully resolved. The United Kingdom and the United States have carried out consultations that touch upon this issue, and how this proceeds will likely impact how other markets respond as well.

Box 13. Autonomous cars and insurance

The advent of mass autonomous or driverless cars is expected to be not in the far future, and a number of countries (France, Singapore, Switzerland, United Kingdom and United States) have started to permit the use of certain roads for driverless cars. In the US, several states have enacted laws on the use of autonomous cars.¹ Driverless cars do have the potential to improve road safety by preventing human error, and efficient traffic flows and fuel usage. As trials take place, the appropriate framework for insurance coverage for such for vehicles will also become an important aspect for governments to consider.

The United Kingdom carried out a consultation on product liability insurance that would be required for autonomous driving or driverless cars in July 2016.¹ The expectation is for driverless cars that can be parked by remote control within the line of sight of the driver, and/or cars that can be auto-piloted with human oversight at high speed will be available for sale in the coming few years.

The US Department of Transportation and National Highway Traffic Safety Administration have issued a paper that proposes updates to its Federal Automated Vehicles Policy in September 2016.² In the US, states have responsibility for motor vehicle insurance and liability regimes. As part of this, states are asked to consider how liability should be allocated among highly automated vehicle (HAV) owners, operators, passengers, manufacturers, and others when a crash occurs.

Insurance coverage of a motor vehicle is for damages and third-party liability (TPL). The difficulty for driverless cars is with who the liability is placed with: the driver or car manufacturer. The manufacturer would be involved through product failure (liability) that resulted in a collision while the driver would be liable when s/he did not take control of the vehicle in certain circumstances resulting in a collision. There is much uncertainty as to how the liability of a collision would be addressed when there is a mixture of human input and autonomy involved in driving.

In May 2016, a Tesla self-driving car was involved in a collision when driving on autopilot mode on the motor way which was fatal to the driver. TPL insurance would not cover the driver unless supplemental insurance was acquired. Some motor manufacturers are offering self-insurance to their automated vehicles.

The UK government inquires on whether there is a need for supplemental insurance coverage such as product liability, and drivers and passengers. The industry has responded that insurers could provide cover for all liabilities, and then take over possible liability claims to the manufacturer for any potential product liability.

The Bank of England recently published projections that with the development and uptake of autonomous cars, the UK motor insurance market may contract by 21% by 2040.³

1. UK Department for Transport and the Centre for Connected and Autonomous Vehicles, Pathway to Driverless Cars: Proposals to support advanced driverless assistance systems and automated vehicle technologies (July 2016).
2. US Department of Transportation and National Highway Traffic Safety Administration, Federal Automated Vehicles Policy: Accelerating the Next Revolution in Roadway Safety (Sept. 2016).
3. Bank of England, Quarterly Bulletin 2017 Q1.

AI and the regulation of technology-based advice

As AI and robo-advice become more widely used, there could be uncertainty as to how current regulation applies. For example, in New Zealand, current regulation requires that advice be provided by a ‘natural person’. Planned changes in New Zealand seek to broaden the definition of advice in order to accommodate technological innovations, and require that entities providing robo-advice be licensed and held to the same requirements as other types of advisors (New Zealand Ministry of Business, Innovation and Employment, 2016). Fully automated services are not allowed to provide advice in Canada, and any robo-advice service must provide some access to personalised advice from an advisor (Lortie, 2016).

Regulators in several jurisdictions have been assessing how technology-based advice should be regulated going forward. The Australian Securities & Investment Commission (ASIC) issued a regulatory guide on robo-advice to retail clients in August 2016 (ASIC, 2016). The guide maintains that the qualification requirements for providers of robo-advice be the same as those for normal advisors, and lays out the requirements for testing the algorithms used and the governance controls and processes in place.

In April 2016, the US Securities Exchange Commission (SEC) approved a rule proposed by the Financial Industry Regulatory Authority (FINRA) that requires developers of algorithmic trading to be registered as a securities trader, and be subject to the same qualification requirements as securities traders to reduce market manipulation (SEC, 2016). The European Supervisory Authorities (European Banking Authority, European Securities and Markets Authority and European Insurance and Occupational Pensions Authority) have issued a joint discussion paper on the automation of financial advice looking at the potential benefits and risks of such innovations in order to determine any additional regulatory action needed to address automated financial advice (Joint Committee of the European Supervisory Authorities, 2015).

The regulations and consultations taking place indicate the need for consistency with the regulation of human financial advice and proper risk and governance controls of the robo-advice being provided. The type of advice being provided by the platform should clearly indicate whether the advice being generated is general or has been personalised. If the advice is determined to be personalised advice, clear processes would need to be in place with respect to how suitability for the client is determined. The algorithms used for automation should be extensively tested, and controls in place to ensure that procedures are in place to ensure their proper functioning.

There is also the issue of whether algorithms may have biases that, whether intentional or unintentional, may be leading to inappropriate advice. This could impact policyholders on a wider base than advisors, as the bias would be built in and anyone who uses the algorithm will be subject to it. Another issue that has been highlighted is that robo-advice and risk management algorithms could lead to herding, increasing pro-cyclicality (Carney, 2017).

Privacy and data protection issues

Technology that engages big data is complex, opaque and often uninterpretable. For this reason, even those who develop the technology for usage of big data may not fully comprehend the impact or appropriate usage of data. Firms should be able to demonstrate that their use of data is appropriate and free of biases in so far as possible (see Box 14).

For big data and data analytics by insurers, privacy and data protection regulations should be rigorously addressed, and ethically uncertain use of data should be fully assessed. In this respect, the wider data protection regime will have a large impact on how this is addressed. In addition, when notification requirements for data breaches are introduced, insurers will need to ensure that databases have the capacity to support this requirement. On the other hand, notification requirements are also likely to assist the development of standalone cyber insurance markets.

Under the current EU regime, for example, cross-border data transfers are not permitted unless made to an Adequate Jurisdiction or the data exporter has implemented a lawful data transfer mechanism (according to EU Data Protection Directive (95/46/EC) and the EU General Data Protection Regulation (GDPR) (see Box 15 below)). To be deemed an Adequate Jurisdiction, the GDPR will be extending the requirements from the Directive for the jurisdiction to have inter alia fundamental rule of law and legal protection of human rights, access to transferred data by public authorities, and effective and functioning data protection agencies (DPAs), international commitments and other obligations in relation to the protection of personal data. For transfer of data within the corporate group, GDPR requires corporate to have Binding Corporate Rules (BCRs) that are legally binding and apply to and be enforced by every member of the group of undertakings envisaged in joint economic activity, and have DPA approval of the BCR.

In the EU, outsourcing arrangements and distribution agreements must be agreed with caution, in terms of who is controlling and processing data. Under the current EU directive data protection regime, the processing of personal data cannot take place unless there are legitimate grounds to do so, which under GDPR will require insurers (data controllers) to carry out a “data protection impact assessment” before processing personal data. Insurers are expected to implement sufficient consents and effective protocols for collecting, handling and processing all data an insurer controls.

Further, under the GDPR, data controllers will be required to notify personal data breaches to the competent supervisory authority, where feasible, no later than 72 hours after becoming aware of the breach, unless the data controller is able to demonstrate that the breach is unlikely to result in a risk to the rights and freedoms of the data subjects concerned. Notifications must also be made to data subjects “without undue delay” if the breach is likely to result in a high risk to their rights and freedoms. Businesses could be fined up to €20 million or 4% of annual global turnover in the most recent financial year, whichever is greater, for failure to comply with GDPR.

Box 14. EU General Data Protection Regulation (GDPR)

The EU Parliament and the European Council agreed on the General Data Protection Regulation (GDPR) in December 2015. It would be applicable to firms that process personal data from those residing in the EU irrespective of whether their services are free or fee-based, whether the firm is based in the EU or not. It is an update to the Data Protection Directive which came into force in 1995. Under the GDPR, fines can be up to €20 million or 4% of global annual turnover, whichever is the higher, if the action of the firm leads to a loss of information or a data breach. It will take effect in member states from 25 May 2018.

GDPR requires private information to be erased without undue delay when the data is no longer required in relation to the purpose for which it was collected. The data used must also restrict use of data when the data quality has been contested by the data subject. The firm must maintain an accurate record of the data subject's agreement for their data to be used for primary and any secondary purposes, without which the firm may not have the right or ability to use the data.

Depending on how and where insurers process their data, this could have implications on how new technologies could be introduced. In addition, the market of cyber risk insurance could expand depending on how GDPR is implemented. It could also impact data analytics which may have relied on data collected for different purposes.

RegTech

RegTech is an emerging area in FinTech, that uses technologies to solve regulatory and compliance requirements more effectively and efficiently (IIF, 2016). Given the various regulatory reforms introduced after the financial crisis, RegTech has the potential to ensure more effective compliance of complex regulations. Technologies that are deemed to be applicable for RegTech include machine learning and artificial intelligence, biometrics, the interpretation of unstructured data such as e-mails and Facebook posts, and the use of application programming interfaces (APIs). Those tools can be brought to bear on such areas as aggregating big data, modelling risk for stress-testing, monitoring of capital-requirement compliance, updating compliance manuals, improving anti-money laundering and know-your-customer (KYC) programs and preventing fraud and in-house violations.

RegTech is an area where countries which have developed regulatory approaches to FinTech have benefited more from start-ups, with 31% of RegTech start-ups incorporating in the UK, as opposed to 20% in the United States (Mulder, 2016).

For insurance, for example, there are data analytics platforms that allow internal data of financial institutions to be converted into regulatory reporting formats, and this could be applied to the insurance sector. There are a number of know-your-customer (KYC) platforms which may use external, open data to verify customer identity. As solvency modernisation initiatives require asset managers of insurers to be able to report investments on a look-through basis, RegTech solutions could provide a platform for insurers to grasp their asset-under-management in a simple interface.

Box 15. RegTech and algorithms

While a number of solutions are being proposed for insurance in the area of RegTech, in particular for fraud prevention and solvency compliance, an emerging area is how insurance companies can ensure that their algorithms are compliant with market conduct regulations. Some start-ups are working to address unintended consequences of algorithms, to ensure that financial institutions, including insurance companies, can integrate algorithms in their customer interface as well as enterprise risk management in a manner that corresponds to the objective of efficiency and effective of business processes while minimising potential risks of algorithms.

ORCAA is a NY-based technology start-up founded by a data scientist to carry out audits of algorithms. The model being used is examined from four phases: data collection and integrity, objective of algorithm, the basis in which the algorithm has been built, and monitoring and updating of the algorithm. Algorithms have been known to use certain proxies, such as post code, which could result in certain segments of the population being unfairly treated depending on how the algorithm is modelled.

An area that financial regulation has been relatively exposed to algorithms is in high-frequency trading, where trading algorithms are used to execute high volume, high speed automated trading in financial markets. Financial regulators such as the Federal Reserve Board (2009) and the French Autorité des Marché Financiers (2009) had issued reports on this issue; nevertheless, a mutual fund trade resulted in a mass withdrawal by high frequency trading and the subsequent crash of the Dow Jones (“Flash Crash”) in May 2010. Germany adopted the High-Frequency Trading Act in 2013, which requires high frequency trading firms, not previously supervised by BaFin, to be supervised by BaFin. Firms are required to ensure that markets are not distorted or interrupted. The algorithm-tagging rule mandates that exchanges have to implement rules requiring all exchange members to flag all algorithmically generated orders with a unique key when sent to a German exchange so as to allow the market surveillance system to allocate all orders to the generating algorithm (Coombs, 2016). The EU Commission has issued a technical standard to the Markets in Financial Instruments Directive (MiFID) II, which will be implemented in 2018, on how to implement articles relevant to high frequency trading in April 2016.

Monitoring of algorithms is complex, requiring special skills and expertise, and regulators and supervisors are often not equipped to understand or assess algorithms and/or whether big data is being appropriately used. In the insurance sector, the known uses of algorithms are primarily related to the customer interface, although solvency initiatives are likely pushing insurers to use algorithms for the measurement of solvency as well.

Regulators should consider how to approach the use of algorithms and big data by insurers that would ensure that they are being appropriately developed and are avoiding, in so far as possible, biases and unintended consequences. In particular, stress testing might be carried out to determine how robo-advice would cope in certain extreme market conditions.

Wider policy considerations

Certain wider digital policies can assist insurance markets develop technological solutions. For example, Estonia's ID card and digital signature services have led to a seamless incorporation of digital insurance solutions, as ID authentication can be easily facilitated (Box 16).

Efforts to improve cyber security, and in particular standards, would assist in raising awareness of risks associated with internet-based transactions as well as ensuring sufficient development of security measures. For example, the UK developed the Cyber Essential Scheme in 2014 to ensure that essential cyber controls were implemented by the private sector. Such schemes would assist in individuals being aware of actions to take to improve their cyber security when using internet-based insurance solutions and providers of InsurTech to ensure that their network is implementing certain standards of security.

Financial institutions which directly access the payment system are routinely subject to supervision/audit of their IT system, as part of operational risk management.⁶ This can include aspects of mobile banking and algorithmic trading as well.⁷ It may be worthwhile to consider how insurance supervision and regulation can be carried out to appropriately monitor what risks such innovations and technological advances can pose to insurers.

The IAIS's Financial Crime Task Force has issued an *Issues Paper on Cyber Risk to the Insurance Sector* (IAIS, 2016) which notes that the Insurance Core Principles do not specifically address cyber risk and cyber resilience, although supervisors would have a basis to address them. The regulatory sandbox approach may permit the introduction and experimenting of the technology in a controlled environment, but ongoing monitoring may be the next step that requires greater discussion.

How funding is available for start-up also appears to influence the number of FinTech and InsurTech start-ups. Many countries have public sector funding schemes for equity financing of enterprises, many established towards the development of venture capital. Some target science and technology ventures (OECD, 2011).⁸

⁶ For example, the Federal Reserve Board has information technology examination guidance (FFIEC Information Technology Examination Handbook – Information Security Booklet (SR-116-14) and FFIEC Cybersecurity Assessment Tool for Chief Executive Officers and Boards of Directors (SR 15-9).

The Basel Committee on Banking Supervision's Core Principles of Effective Banking Supervision principle 25 on operational risk has part of the essential criteria that supervisor determines that banks have established appropriate information technology policies and processes to identify, assess, monitor and manage technology risks.

⁷ BaFin has a supervisory process that clearly identifies the algorithmic trading as part of this. BaFin (2013), IT Security: Expectations of banking supervision, www.bafin.de/SharedDocs/Veroeffentlichungen/EN/Fachartikel/2013/fa_bj_2013_11_it_sicherheit_en.html.

⁸ As described in OECD (2012), governments have participated in funds of funds investing in local high-technology companies (Mexico, Germany). In Germany, some Länder have set up equity guarantee facilities for private investment in local SMEs. France, Finland, Germany and Netherlands have been active in joining science and technology research with public funding.

Box 16. Estonia's electronic ID card and digital signature services

As part of "e-Estonia," which is the term used to describe Estonia as one of the leading countries in e-government solutions, the government developed the ID card services for most of its residences which serves as an identity document and proof of ID for online services. The ID card has a chip that not only holds information about the card's owner, but also two certificates, one to authenticate identity and the second to render a digital signature. In addition to the ID card, a mobile phone can be used to identify oneself for online services, Mobii-ID. A mobile phone can act as a card and a card reader at the same time. For this purpose, Estonia adopted a legislation on digital signatures in 2000 to enable a written signature be replaced by an electronic one.

Adapting the ID-card and digital signature services, an Estonian insurer and broker have developed online services. Intermediation is carried out through a matching and quoting system, and enables policies to become effective immediately as authentication of identity and by linking this to car registration system assists to expedite the process.

"Gazelles", young high-growth innovative firms, have been a focus of entrepreneurship policy and have drawn policy makers' attention because of the number of jobs they are estimated to create. Mexico, United States, Spain and the Netherlands have specific policies to support them.

8. Conclusions

It appears that InsurTech businesses are developing business models that may, in fact, better address the insurability of policyholders by using technology to simplify the contracting process, and tailoring policies to better suit their needs. There is also scope for insurance to adapt to wider changes in economic activity, such as the sharing economy and the large millennial cohort. The other striking characteristic of many InsurTechs are the social and environmental considerations that their business models incorporate. Many of the InsurTechs try to improve the transparency of the contracting as well as the claims management process, including fraud detection, providing greater clarity to where the premiums paid go, which could have an impact on the wider insurance industry.

There also seems to be a wider recognition that the fine print of an insurance quotation is tedious to read, without giving much insight into the actual coverage of the policy for retail clients. Sites are being developed that simplify the information on coverage of a policy and try to clarify the level of premiums, while introducing peer pressure for risk mitigation. There is often an algorithm to carry out the risk assessment using a few questions which may also use external data sources to assist the assessment.

The scale of InsurTech investment is growing, and by (re)insurers in particular. As InsurTechs start to attract a large number of users/policyholders, and provide an improved customer experience, (re)insurers will likely hope to capitalise on the success of such start-ups by having a stake in them. A number of (re)insurers have created strategic venture capital arms for this purpose, and have been making strategic investments in a number of start-ups.

Some countries are establishing regulatory platforms, such as the regulatory sandbox approach, that allow innovative technologies to enter the market, and this will assist in encouraging start-ups to develop their business model while becoming acclimatised with regulatory requirements. Start-ups may opt to initiate their business in markets which have such a ready platform.

More broadly, these technologies have the potential to bring better and more customised insurance coverage to more people, including those in the lower income bracket, and bring greater financial protection. In addition, the new distribution models can simplify the insurance process, and bring insurance to less developed markets.

However, InsurTech will have to meet insurance regulations as well as wider data protection and cyber security requirements as they try to scale their business. Ensuring that not only is the customer experience positive when it is scaled up, but that consumer protection and safety standards are met will remain a challenge for start-ups and regulators alike.

The development of innovation hubs and regulatory sandbox approaches provides an environment for new technologies and innovations to be nurtured, and has the potential to

enable a greater understanding of their impact on the markets. However, greater clarity on the appropriate level of regulation in such platforms and how they graduate into full regulation requires further discussion in order to balance the need for innovation as well as the need for adequate protection of policyholders.

Market conduct and internal controls are the main area in which regulatory consideration would apply for InsurTech, and while such rules are neutral to technologies, the practical impact requires closer examination. In particular, internal controls that ensure compliance with laws and regulation and fair conduct towards consumers and policyholders will be important.

The impact of the use of big data and algorithms and how regulators could approach their evaluation is unclear. The complexity involved has implications for how regulators organise themselves as well as for how the spirit of regulation is applied. Firms should be expected to demonstrate that their use of data is appropriate and free of bias in so far as possible. RegTech may have a role to play in assisting that this is carried out going forward.

Based on the analysis, the OECD can contribute to the efforts of governments to ensure technology and innovation in the insurance sector, as well in the wider financial system, could be address through additional research on some of the key areas raised above.

For example, the OECD could:

- Analyse the trends of InsurTech in terms of technologies and innovations being introduced and how it might impact the insurance sector in terms of business models and processes, as well as regulation.
- Consider the regulations relevant to technological and innovation in the insurance sector, and discuss regulatory approaches which can be taken to facilitate this.
- Discuss the development of best practices of regulatory sandbox approaches, in particular for the insurance sector, but also including the wider financial sector in cooperation with the OECD Committee on Financial Markets.
- Carry out a stock-taking of how insurance solutions are being addressed by regulation, for both start-ups as well as existing insurers. This could also be done for the wider financial sector in cooperation with other OECD bodies and in particular the OECD Committee on Financial Markets.

References

- Accenture (2015), The Rise of Robo-Advice.
- Acord & Surely (2016), AI—The Potential for Automated Advisory in the Insurance Industry (February).
- ASIC (2016), Regulatory guidance on providing digital financial product advice to retail clients (August, Regulatory guide 255).
- Autorité des Marchés Financiers (2009, “Key Issues Arising from the Emergence of Dark Pools and Crossing Networks: Press Backgrounders”, 20 October.
- BaFin (2013), IT Security: Expectations of banking supervision
www.bafin.de/SharedDocs/Veroeffentlichungen/EN/Fachartikel/2013/fa_bj_2013_11_it_sicherheit_en.html.
- Biener, C., Eling, M., & Schmit, J. (2013), Regulation in microinsurance markets: principles, practice and directions for future development (Working papers on risk management and insurance No. 127).
- Capgemini Consulting (2015), Fixing the Insurance Industry.
- Carney, M (2017) “The Promise of FinTech—Something New Under the Sun?” 25 January (Speech given to the Deutsche Bundesbank G20 conference on “Digitising finance, financial inclusion and financial literacy”):
www.bankofengland.co.uk/publications/Documents/speeches/2017/speech956.pdf.
- CB Insights (2017a), Insurance Tech Start-ups Raise \$1.7B Across 173 Deals in 2016 (January) www.cbinsights.com/blog/2016-insurance-tech-funding/.
- CB Insights (2017b), Where Insurers and Reinsurers Invested in Tech Start-ups in 2016 (January) www.cbinsights.com/blog/2016-insurance-cvc-total/.
- CB Insights (2016a), Analyzing the Insurance tech Investment Landscape (July).
- CB Insights (2016b), 6 Charts Breaking Down How Insurers Are Investing in Tech (September) Start-ups <https://www.cbinsights.com/blog/insurance-corporate-venturing-2016/>.
- CB Insights (2016c), InsurTech Connect 2016 (October)
<https://www.cbinsights.com/reports/ITC-insurance-tech-deck.pdf>.
- CFTC & SEC. (2010), “Findings regarding the market events of May 6, 2010”
www.cftc.gov/ucm/groups/public/@otherif/documents/ifdocs/staff-findings050610.pdf.
- Chaboud, A., B. Chiquoine, E. Hjalmarsson and C. Vega (2009) “Rise of the Machines: Algorithmic Trading in the Foreign Exchange Market” (International Finance Discussion Papers, No. 980, Board of Governors of the Federal Reserve System).

- Coombs, Nathan (2016) What is an algorithm? Financial regulation in the era of high-frequency trading, 45, *Economy and Society*.
- E*Trade Financial (2016), E*TRADE Study Reveals Many Investors Prefer a Hybrid Model When Considering RoboAdvisors (25 February) <https://about.etrade.com/releasedetail.cfm?ReleaseID=957103>.
- FTC (2015), Internet of Things: Privacy & Security in a Connected World (January, FTC Staff Report).
- FTC (2012), Protecting Consumer Privacy in an Era of Rapid Change: Recommendation for Business and Policymakers (March).
- GAO (2005), Credit Reporting Literacy (GA0-05-223).
- Gartner (2016), Measuring the Strategic Value of the Internet of Things for Industries (April 28).
- Goldman Sachs Global Investment Research (2016), Millennials coming of age www.goldmansachs.com/our-thinking/pages/millennials/index.html#intro.
- HM Treasury and FCA (2016), Financial Advice Market Review: Final Report (March).
- IHS Markit (2016), Usage-Based Insurance Expected to Grow to 142 Million Subscribers Globally by 2023 (6 May) <http://press.ihs.com/press-release/automotive/usage-based-insurance-expected-grow-142-million-subscribers-globally-2023-i>.
- IAIS (2016), Issues Paper on Cyber Risk to the Insurance Sector (August)
- IIF (2016), Regtech in financial services: technology solutions for compliance and reporting (March).
- Investor Junkie (2016), The True Costs of Robo-Advisors – What Are the Annual Fees? (9 October) <https://investorjunkie.com/42668/true-costs-robo-advisors/>.
- Joint Committee of the European Supervisory Authorities (2015), Joint Committee Discussion Paper on automation in financial advice.
- Keller, B & Hott, C (2015), Big data, Insurance and the Expulsion from the Garden of Eden (Geneva Association Insurance Economics Newsletter No.72).
- KPMG & CB Insights (2016), Venture Pulse Q4 2015 (January).
- Lortie, P. (2016), A Major Setback for Retirement Savings: Changing how financial advisers are compensated could hurt less-than-wealthy investors most.
- McKinsey (2015), Insurance on the threshold of digitization: Implications for the Life and P&C workforce (December).
- McKinsey (2010), The Internet of Things (March) www.mckinsey.com/industries/high-tech/our-insights/the-internet-of-things.
- Mulder, JM (2016), 100 RegTech start-ups to follow (17 June) www.linkedin.com/pulse/100-regtech-start-ups-follow-jan-maarten-mulder.
- New Zealand Ministry of Business, Innovation and Employment (2016), Final Report: Review of the Financial Advisers Act 2008 and the Financial Service Providers (Registration and Dispute Resolution) Act 2008.
- OECD (2012), OECD Science, Technology and Industry Outlook 2012, OECD Publishing, Paris. http://dx.doi.org/10.1787/sti_outlook-2012-en.

- OECD (2011), Science, Technology and Industry Outlook Policy Database.
http://qdd.oecd.org/DATA/STIOb_COUNTRY_ITEM_TOPIC_POLICY_SOURCE/C6-1...STIO_2012?Page=1.
- PwC (2016), Blockchain: the 5 billion dollar opportunity for reinsurers.
- SEC (2016), Approving a Proposed Rule Change to Require Registration as Securities Traders of Associated Persons Primarily Responsible for the Design, Development, Significant Modification of Algorithmic Trading Strategies or Responsible for the Day-to-Day Supervision of Such Activities (7 April, Release No. 34-77551; File No. SR-FINRA-2016-007).
- UK Transport Research Laboratory (2015), Provision of telematics research (2015).
- Zurich Fleet Intelligence (2016), Reduced fleet operating costs
www.zurichfleetintelligence.com/us-en/benefits.php.



Technology and innovation in the insurance sector

“Insurtech” is the term being used to describe the new technologies with the potential to bring innovation to the insurance sector and impact the regulatory practices of insurance markets. This report catalogues these technologies and examines how InsurTech is being funded and how insurers are engaging with the start-ups entering the market.



This report contributes to the OECD Going Digital project which provides policy makers with tools to help economies and societies prosper in an increasingly digital and data-driven world. For more information, visit www.oecd.org/going-digital.

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