



IAIS

INTERNATIONAL ASSOCIATION OF
INSURANCE SUPERVISORS

FinTech Developments in the Insurance Industry

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Established in 1994, the IAIS is the international standard setting body responsible for developing principles, standards and other supporting material for the supervision of the insurance sector and assisting in their implementation. The IAIS also provides a forum for Members to share their experiences and understanding of insurance supervision and insurance markets.

The IAIS coordinates its work with other international financial policymakers and associations of supervisors or regulators, and assists in shaping financial systems globally. In particular, the IAIS is a member of the Financial Stability Board (FSB), member of the Standards Advisory Council of the International Accounting Standards Board (IASB), and partner in the Access to Insurance Initiative (A2ii). In recognition of its collective expertise, the IAIS also is routinely called upon by the G20 leaders and other international standard setting bodies for input on insurance issues as well as on issues related to the regulation and supervision of the global financial sector.

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List of Acronyms

AI	Artificial Intelligence
AML	Anti-Money Laundering
BTF	Big Technology Firm
DLT	Distributed Ledger Technology
EU	European Union
FinTech	Financial Technology (see definition in section 1)
FNOL	First Notice of Loss
GAFA	Google, Amazon, Facebook, Apple
InsurTech	Insurance Technology (see definition in section 1)
IoT	Internet of Things
IT	Information Technology
KYC	Know-your-Customer
ML	Machine Learning
P2P	Peer to Peer
VC	Venture Capital / Venture Capitalist
WEF	World Economic Forum

Executive Summary

1. The term Financial Technologies or “Fintech” is used to describe “technologically enabled financial innovation that could result in new business models, applications, processes, or products with an associated material effect on financial markets and institutions and the provision of financial services”¹ and covers a broad array of technical innovations that are finding their way into the financial industry.

2. In particular, the variety of emerging technologies and innovative business models that have the potential to transform the insurance business is referred throughout this document as “InsurTech”. The IAIS considered it necessary to take stock of these innovations, in particular those relevant to the insurance industry and its supervision.

3. This report contains a description of these innovations, their drivers and possible impacts based on a scenario analysis. The findings in this report are intended to inform the IAIS, the entire insurance supervisory community and other stakeholders allowing further strategic consideration and discussion of possible future work.

4. InsurTech will have a significant impact on insurers’ business models. Regulation, together with firm-level supervision, will need to evolve to ensure the right balance between maintaining policyholder protection without inadvertently stifling innovation.

Stocktake exercise:

5. The level of investment in technology within the insurance sector has historically lagged behind the banking sector. However, as the banking sector matures, innovators are seeking to disrupt other financial services – insurance is viewed by many as the next great opportunity for investment.

6. The number of new companies (“start-ups”) targeting the insurance sector has significantly increased in recent years. These start-ups are targeting all areas of the insurance value chain – from marketing & distribution, through to underwriting & pricing of risks, and ultimately to settlement of claims. In most cases individual start-ups are focussing on improving specific aspects of the value chain and collaborating with incumbents, but there have also been limited examples where start-ups are looking at ways to remove the need for an insurer - using peer-to-peer type business models.

7. According to CB Insights, InsurTech start-ups attracted investment exceeding \$1.7Bn in 2016, although this excludes the significant investments by incumbents to ensure they are not left behind. Note: three out of four insurers see a risk of disruption of part of their business, while 90% fear losing part of their business to InsurTech start-ups.

8. The confluence of a number of supply-side and demand-side factors should increase the pace of change – meaning that it is expected to see more investment and a larger number of technology firms seeking to disrupt the insurance sector. The following have all been cited as reasons for a more rapid pace of change:

a. Supply-side factors:

- i. *Increased investor appetite:* Traditional investors in banking technology are increasingly looking at expanding their investment in perceived similar type ventures. It should be noted that the current low interest rate environment is also contributing the need for investors to expand their investment horizon.

¹ Financial Stability Board; 16 March 2016.

- ii. *Increased intellectual firepower*: Technology firms and entrepreneurs are increasingly looking at insurance as the banking sector becomes more competitive in this space, and driving down profitability.
 - iii. *Increased availability of data and analytical tools*: The increasing number of connected devices combined with ever smarter and powerful analytical capabilities is improving firms' understanding of policyholder behaviour.
- b. Demand-side factors
- i. *Societal shifts*: A younger "always-connected" generation is changing perceptions as to how to engage with current and future policyholders.
 - ii. *Seeking competitive advantages and operational efficiencies*: Most insurers operate in highly competitive markets resulting in continued pressure on premium rates. Improving customer engagement and loyalty through the use of technology, as well as digitising certain back-office functions is a core strategy of many insurers.

9. The main types of innovations that fall within the scope of InsurTech are listed below. The relatively long list highlights both the diverse nature of risks covered by insurers, but also the difficulty in forecasting the impact on the insurance sector. In this paper it is captured how individual innovations could impact different sectors – however, the analysis does not considered "the perfect storm" in which all innovations simultaneously impact the insurance model:

- Digital platforms (internet, smartphones)
- Internet of Things (IoT)
- Telematics / Telemetry
- Big Data and Data Analytics
- Comparators and Robo advisors
- Machine Learning (ML) and Artificial Intelligence (AI)
- Distributed Ledger Technology (DLT), Blockchain and Smart Contracts
- Peer-to-peer, Usage Based and On Demand Insurance

10. Some of the innovations may disrupt the conventional risk pooling that is common to insurance. The collection of data on insurer risk or policyholders may enable a more granular risk categorisation that creates a breakdown of the current risk pooling principles and may lead to issues around affordability of certain insurance products, possibly even leading to exclusion. This seems to be a valid concern regardless of the scenarios below. The role of the supervisor is first and foremost to identify such a trend if and when this occurs and raise awareness at the appropriate policy and political level(s).

Scenario-based exercise:

11. The basis of the scenario-based approach was to consider the varying degrees to which technology firms could disrupt the insurance business model and the insurer landscape. At a more benign level Scenario 1 considers the supervisory implications assuming that insurers effectively maintain the overall customer relationship and leverage technology firms for their own advantage. In contrast Scenario 2 considers the case where the insurance value chain is increasingly disaggregated, such that insurers may no longer own the customer relationship, and instead rely on business relationships with technology firms or service providers for premium income. Finally, Scenario 3 considers the possibility that big technology firms leverage their technology and analytical advantage to squeeze out traditional insurers.

12. The detailed discussion and conclusions for each of the product related scenarios are covered in Section 5. Some of the core themes and the supervisory considerations that need to be addressed as the role of technology in insurance evolves are the following²:

- a. **Competitiveness:** Expected to reduce longer-term regardless of the disruption to the insurance value chain. In part this is driven by the expectation that the technology will improve risk selection and will reduce the risk overall.

Supervisory consideration: should supervisors do more to encourage / accommodate competition and new entrants, noting that longer-term in other areas technology reduces the number of players? For example, there are only a handful of serious mobile phone providers or internet search engines.

- b. **Consumer choice:** Expected to reduce – albeit the extent varies according to the scenario. There are two reasons for this assessment: (1) technology is expected to lead to greater customisation of the product to the individual - however, this could lead to a reduction in comparability between product providers, thereby limiting consumer choice; and (2) existing insurance providers will benefit from increasing individual policyholder data. In the absence of data transferability competitors may be reluctant to quote.

Supervisory considerations: (1) how to ensure that the ability to compare products between providers is not compromised as new technology seeks to find ever smaller segmentations; and (2) whether to legislate on data transferability between providers.

- c. **Interconnectedness:** No material differences were identified for the different scenarios. Instead each scenario highlighted the potential for increased risk of interconnectedness arising from the use of a limited number of technology platforms that support Big Data and increased data analytics - e.g. common cloud storage providers.

Supervisory consideration: current reporting may need to be refined to capture additional information to monitor potential for increasing interconnectedness – e.g. data storage providers.

- d. **Ability for regulatory oversight:** Increased use of technology to optimise processes and analytics is expected to add more participants in the insurance value chain which is expected to reduce the ability for regulatory oversight. Under scenario 2 (i.e. fragmentation) the impact could be significant, as risk carriers are potentially one or more steps removed from the policyholder.

Supervisory consideration: the regulatory perimeter may need to be reassessed to ensure that consumers are adequately protected, and that regulators continue to have the ability to monitor market trends.

- e. **Business model viability & prudential capital requirements:** Underlying business models are expected to adapt - although the extent to which incumbents are able to adapt will depend on the speed of change. However, over the longer term there is potential for a reduction in business model resilience. This is based on the presumption that on the one hand technology will reduce the average risk, thereby lowering the risk premium, but on the other that risks will continue to be susceptible to extreme events. In the latter case the extreme risks may increase due to increased connectivity – and hence may represent a larger proportion of the resources for a typical insurer today.

Supervisory consideration: As the risk-profile changes supervisors will need to ensure that the regulatory capital framework continues to adequately capture the changing risk profile.

- f. **Conduct of business:** Under all scenarios improvements in technology is expected to result in insurers or technology firms providing more bespoke products to policyholders.

² See section 5.1. for a description of these themes and considerations.

However, if, as some anticipate, insurance become an ever reducing part of a service, there is a potential risk that insurance products reflect the firm's objectives rather than the consumer. This is for example seen in the inclusive insurance space where mobile phone operators offer insurance (sometimes for free) as a loyalty mechanism.

Supervisory consideration: Should regulation require a minimum level of transparency for consumers that highlight the potential conflicts of interest – this is particularly relevant should the insurance value chain become highly fragmented?

- g. **Data ownership:** The continual rise of the use of internet connected devices is expected to exponentially increase the data collected and analysed from policyholders. Regardless of the regulation of data protection in each jurisdiction, under all scenarios, insurers and technology firms will need to implement appropriate technical and organisational measures to maintain security of personal data and prevent any unauthorised access or processing.

Supervisory consideration: (1) Regulation on data protection may need to be reassessed to include provisions on data transferability between providers and (2) as more institutions are relying on Big Data technologies, supervisors will need to ensure that regulatory framework includes prudential and organisational obligations related to IT management, cyber security and internal controls for outsourcing services.

13. Developments in Big Data and AI go beyond product level and are affecting business processes of the insurer. For incumbents and innovators, the application of Big Data and AI is a significant competitive advantage. However, they will need to invest in preventing cyber incidents as well as invest in training or hiring specialised expertise for algorithms design and application.

Supervisory consideration: There is a need for measures to protect consumers' personal data in its collection, processing, correction and sharing, as well as to ensure information security and data privacy policies, procedures, methods and tools aimed at protecting data from cyber incidents, breaches or unintended use.

14. Distributed Ledger Technology is still in its infancy as far as the insurance sector is concerned. The impression is that other financial sectors are ahead of the game but the potential use in insurance may be even more significant.

Supervisory consideration: DLT applications may require changes to existing regulations, standards of practice, and the creation of new legal and liability frameworks. It seems too early to take further action than close monitoring, possibly via the usual financial returns or through enhanced reporting where required. Specifically, the implementation of smart contracts may require additional stakeholder alignment and governance considerations.

Conclusions:

15. As it is illustrated in this document, at this stage there are too many unknowns and uncertainties that prevent from concluding the most likely outcome, and hence impact for regulation and supervision in insurance. In most cases the impact will be determined through a combination of:

- Technology: which in many cases still needs to demonstrate longer-term how it can disrupt aspects of the insurance value chain (supply side disruption); and
- Societal changes: understanding how consumers may react to or influence the changing insurance landscape (demand side disruption).

16. The scenario analysis has been designed to specifically draw out the possible implications for insurance supervision (capturing both prudential and conduct of business issues), thereby ensuring that the conclusions can assist in shaping the future strategic

direction for the IAIS in this area. The results of the individual scenarios should also assist in defining future work packages as the implications of specific innovations / technologies for consumers and the insurance industry become clearer.

17. As a consequence, insurance supervisors may face the following challenges in the near future:

- a. Supervisors need to understand how innovations work and are applied in order to ensure adequate assessment of new product and business models.
- b. Supervisors will also need to balance the risks of new innovations against the benefits for policyholders and the insurance sector as a whole, and consider how to create the proper environment to foster innovation for example through regulatory sandboxes or innovation hubs.
- c. Supervisors and policymakers will need to evaluate and where appropriate adjust their regulatory framework from a prudential and conduct of business perspective to adequately address changed risks and business models.
- d. Supervisors need to arrange proper technical resources, knowledge and skills to be able to deal with FinTech in the future. The collaboration with other stakeholders needs to be stepped up to build up and maintain an adequate understanding of innovations.

1. Introduction

18. Under the heading “FinTech” innovations are taking place affecting the way insurance business is undertaken and posing challenges for both the insurance industry, customers and insurance supervision. In the course of 2016, the IAIS considered it necessary to take stock of these developments, in particular those relevant to the insurance industry and its supervision.

19. It therefore has undertaken a stocktaking exercise to identify these developments, their drivers and possible impacts. Part of the exercise was a scenario analysis to gain an understanding of possible implications of these developments for the insurance landscape and insurance supervision. The results of this analysis is included in this report. Its purpose is to inform the IAIS, the entire insurance supervisory community and other stakeholders allowing further consideration from a strategic perspective and feeding into the discussions on possible future work.

Definitions

20. The term FinTech has been described as “technologically enabled financial innovation that could result in new business models, applications, processes, or products with an associated material effect on financial markets and institutions and the provision of financial services”³. Other definitions are:

- The use of technology and innovative business models in financial services (World Economic Forum);
- Organisations combining innovative business models and technology to enable, enhance and disrupt financial services (EY);
- Computer programs and other technology used to support or enable banking and financial services (Oxford Dictionaries).

21. FinTech covers a broad array of technical innovations that are finding their way into the financial industry. InsurTech is the insurance-specific branch of FinTech that refers to the variety of emerging technologies and innovative business models that have the potential to transform the insurance business. Section 3 of this report provides an overview of the relevant InsurTech innovations affecting insurance.

³ Financial Stability Board; 16 March 2016.

2. Drivers of InsurTech Innovation

22. Drivers of innovation result from a combination of “push factors” (i.e. those that impact the *supply* of new technology available for insurers/policyholders) and “pull factors” (i.e. those that impact consumer/insurers *demand* for new products). The following provides a brief overview of the main push and pull factors that are currently driving InsurTech innovation.

Push factors:

23. *Increased investment through leveraging the FinTech ecosystem:* To date, technological investment has focussed on the larger banking sector, for instance by assisting ways to enhance payment services. From an innovation perspective there is little read across of this technology to the insurance industry; however, it has created a heightened level of investor and tech company engagement towards the use of new technologies within the financial sector. This in turn has increased the level of capital investment in this sector more broadly.

24. *Increased intellectual firepower: Entrepreneurs expanding their opportunities:* Many start-ups in the insurance ecosystem are founded by entrepreneurs seeking to find a lucrative business opportunity for their innovations. As the banking industry becomes more competitive some see insurance as the new frontier. In addition, many entrepreneurs are seeking to exploit what they see as weaknesses in the incumbents business models – for instance legacy IT systems and inertia in responding to changing consumer demands, such as a sharing economy.

25. *Increased availability of data and analytical tools:* The IoT and wearables have allowed firms to capture more information on individuals than ever before. This factor combined with increased computing power and increasingly smart algorithms is allowing firms to improve forecasting for a wide range of applications including insurance.

Pull factors:

26. *Societal changes impacting type of product and how it is consumed:* For example catering for millennials potentially requires consideration for an increased appetite for mobility usage (always online generation), sharing economy, self-management and generally simplified on-demand type products (possibly embedded within a service offering).

27. *Competitive advantage:* Many incumbents view technology as a way to expand the consumer interaction beyond the once-a-year renewal request notification with a view to improve customer loyalty. In addition, incumbents are also investigating the use of new technologies to improve pricing, risk selection and detection of fraud in claims settlements.

28. *Back-office efficiency:* In many markets worldwide insurance is a highly competitive industry. Consequently, many incumbents are seeking ways to improve the efficiency of their (back-office) operations to reduce costs – for instance digitising certain operations to reduce human involvement.

3. Overview of current technological innovations in Insurance and impact on insurance business

29. A summary of the significant innovations, together with the expected timelines for more wide-scale adoption, currently being considered by insurers⁴ is provided below. In each case this is followed by a brief description of their potential application and hence impact on the insurance business. A more detailed description is provided in Annex 1.

1. Digital platforms (internet, smartphones) [short-term/already in use]

Various initiatives have emerged to improve the customer experience or service such as pay-per-use products or Peer-to-peer (P2P) Insurance.

2. Internet of Things (IoT)⁵ [medium-term]

IoT involves the internetworking of physical devices, vehicles, buildings and other items (also referred to as "connected devices" and "smart devices"), embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data.

3. Telematics / Telemetry [short/medium -term]

In the context of IoT, telematics involves telecommunications, sensors and computer science to allow sending, receiving, storing and processing data via telecommunication devices, affecting or not control on remote objects. Telemetry involves the transmission of measurements from the location of origin to the location of computing and consumption, especially without affecting control on the remote objects.

In the context of insurance its main applications are Connected Cars, Advanced Driver Assistance Systems (ADAS), Health monitoring and Home monitoring.

4. Big Data⁶ and Data Analytics⁷ [short-term / already in use]

In the insurance market, Big Data and Data Analytics could be used in various processes, such as product offerings, risk selection, pricing, cross selling, claims prediction and fraud detection, for example to offer customized products and allow automated underwriting.

5. Comparators and Robo advisors [medium-term]

Online services that provide automated, algorithm-based product comparison and advice without human intervention.

6. Machine Learning (ML) and Artificial Intelligence (AI) [medium-term]

The use of ML and AI enables several insurance industry processes to use data in real time and, especially, use events prediction (e.g. vehicles thefts, health problems and

⁴ Based on PwC Global FinTech Survey 2016 – Key trends

⁵ The term IoT has been defined as a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies (source <http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=y.2060>)

⁶ Big Data is the term used for the storage of data from different sources, in large volume and speed.

⁷ Data Analytics is the process of inspecting, cleaning, transforming, and modelling data with the goal of discovering useful information, suggesting conclusions, and supporting decision-making.

weather events). There is a vast scope for AI, not only in a better pricing of risks, but also in fraud prevention, claims handling or in preventive counselling.

7. Distributed Ledger Technology (DLT) [long-term]

A distributed ledger is essentially an asset database that can be shared across a network of multiple sites, geographies or institutions. The security and accuracy of the assets stored in the ledger are maintained cryptographically through the use of 'keys' and signatures to control who can do what within the shared ledger.

a. Blockchain [long-term]

This is a type of decentralised distributed ledger, comprised of unchangeable, digitally recorded data in packages called "blocks" which are stored in a linear chain.

b. Smart Contracts [long-term]

The novelty of DLT is that it is more than just a database — it can also set rules about a transaction (business logic) that are tied to the transaction itself. Smart contract is a term used to describe computer program code that is capable of facilitating, executing, and enforcing the negotiation or performance of an agreement using DLT.

8. Peer-to-peer, Usage Based, On Demand Insurance [short-term];

Emerging technologies are likely to result in the introduction of new business models, such as:

- a. Peer to peer insurance: business model that allows insureds to pool their capital, self-organize and self-administer their own insurance. Although it is not an innovative concept, emerging technologies (like DLT) offer substantial benefits for implementing this model in a broader scale.
- b. Usage based insurance: new business model introduced by auto insurers that more closely aligns driving behaviors with premium rates for auto insurance.
- c. On demand insurance: new business model that specializes in covering only those risks faced at a certain moment.

30. These technological innovations and new business models are likely to result in changes in the nature and type of risks covered as well as potentially changing the relationship between insurers and policyholders. As a result there are a number of different strategies emerging that are seeking to exploit these changes; notably:

- a. The aggregator model: companies focused on user interaction and positioned on the front-end, with several options for the same product or various insurance products to meet a specific need, always aggregating different insurers;
- b. The integrator model: player whose business aims to meet specific user needs, and the insurance product is a component of the offered solution (insurance embedded within a service);
- c. "Game changer": completely digital insurers focused on specific audiences or niches (e.g. products for "on demand" economy) and peer-to-peer insurance platforms.

4. The InsurTech Landscape

31. The section provides an overview of the current level of investment in FinTech and InsurTech, provides details of the new start-ups and their targeted focus area and provides examples of how some incumbents are working together with these new technology firms.

a. Global Investment in FinTech

32. Global investment in FinTech has grown during the last years. More than US \$50 billion has been invested in almost 2,500 FinTech companies since 2010⁸. Since 2014, FinTech venture investment has grown significantly, driven by a new wave of digitalization of financial services by technology companies. In 2015, global investment in Fintech companies totalled US\$19.1 billion, with US\$13.8 billion invested into venture capital (VC) backed Fintech companies, a 106 percent jump compared to 2014, and a record year for VC-backed FinTech investment⁹.

33. For the 2nd quarter of 2016, overall funding in Fintech was US\$ 9.4 billion, with a decline in funding to VC backed Fintech companies to US\$ 2.5 billion, mainly due to uncertainties associated to global market conditions, such as the UK Brexit, the approaching US presidential election, among other factors. Despite this quarter's decline, KPMG and CB Insights analysts¹⁰ suggest that if companies continue to raise money at the same rate as in the first quarter, FinTech funding will exceed 2015 investment levels.

b. Global Investment in InsurTech

34. In the last years, FinTech investment has been largely focused around banking and capital markets. However, maturity has brought much greater diversification, with innovators seeking to disrupt other financial services, such as insurance, which is viewed as the next great opportunity for investment. In 2014, technology companies targeting the insurance business received less than \$800 million in funding, but in 2015 InsurTech start-ups attracted more than three times that amount, receiving approximately \$2.5 billion. The growth tendency could continue for this year, since in the first half of 2016, VC backed InsurTech companies received \$ 1 billion in funding¹¹.

⁸ http://www.fintechinnovationlablondon.co.uk/pdf/Fintech_Evolving_Landscape_2016.pdf

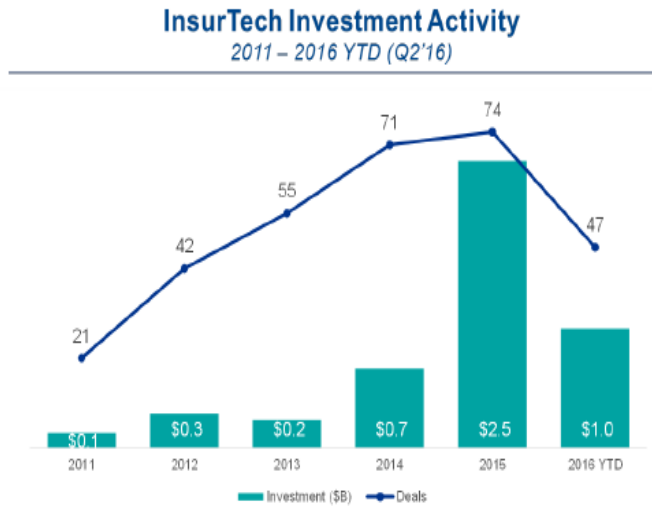
⁹ <https://home.kpmg.com/content/dam/kpmg/pdf/2016/06/pulse-of-fintech-2015-review.pdf>

¹⁰ <https://assets.kpmg.com/content/dam/kpmg/xx/pdf/2016/08/the-pulse-of-fintech-q2-report.pdf>

¹¹ <https://assets.kpmg.com/content/dam/kpmg/xx/pdf/2016/08/the-pulse-of-fintech-q2-report.pdf>

INSURTECH INVESTMENT ACTIVITY

Top Deals & Cities, 2016 (YTD)



Source: The Pulse of FinTech, Q2 2016, Global Analysis of FinTech Venture Funding, KPMG International and CB Insights (data provided by CB Insights) August 17th, 2016.

Source: CB Insights and KPMG International, The Pulse of FinTech, Q2 2016.

Top Deals

Oscar Health

\$400M // Series C

Clover Health

\$160M // Series C

Bright Health

\$80M // Series A

Justworks

\$33M // Series C

Top Cities

San Francisco

8 Deals // \$213M

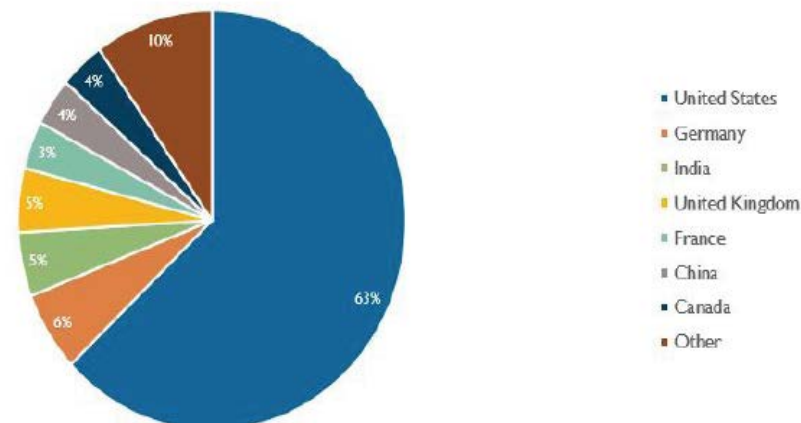
New York

5 Deals // \$467M

35. According to a KPMG International and CB Insights report, in the first half of 2016, 63% of deal activity to InsurTech market went to US-based start-ups, while Germany, India and the UK each took 5%+ of the deal share over the period, with no other country registering more than 3% of deal share. InsurTech start-ups that attracted the most funds were Oscar Health, Clover Health, Bright Health and Justworks. Backing came from venture capital firms, private equity companies and the investment arms of incumbent insurers.

Insurance Tech Deals By Geography

HI'16



www.cbinsights.com

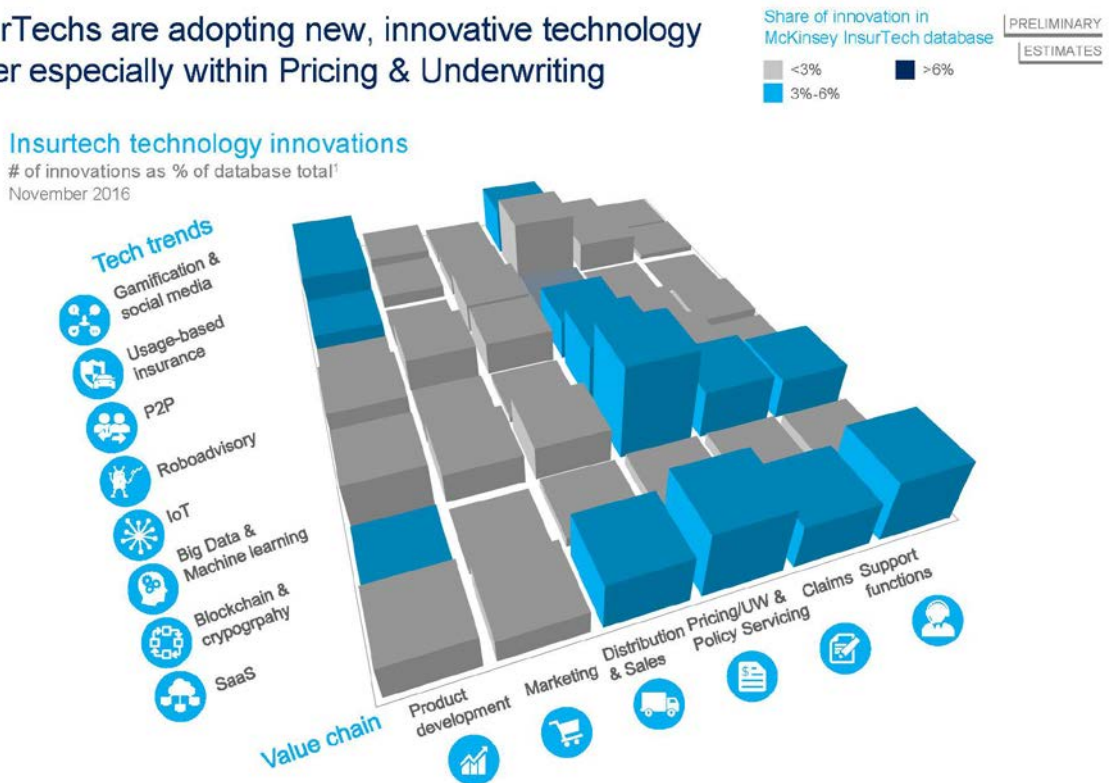
Source: CB Insights, Analyzing the Insurance Tech Landscape. 2016

c. InsurTech start-ups

InsurTech across the value chain

36. InsurTech start-ups are targeting all areas of the insurance value chain and even creating entirely new business models. Every process in the value chain, from product development to claims management is being revolutionized by technological innovations, the pricing and underwriting processes being the most impacted. A detailed description of how InsurTech is affecting each area of the value chain as well as examples of current start-ups that are focusing on the insurance business is provided in annex 2.

InsurTechs are adopting new, innovative technology faster especially within Pricing & Underwriting



¹ ~500 commercially most well-known cases registered in the database (excluding wealth management related innovations)

SOURCE: McKinsey Panorama: InsurTech database

McKinsey & Company 1

Source: "InsurTech – the threat that inspires" by Tanguy Caitlin, Johannes-Tobias Lorenz, Björn Münstermann & Peter Braad Olesen at Mckinsey.com

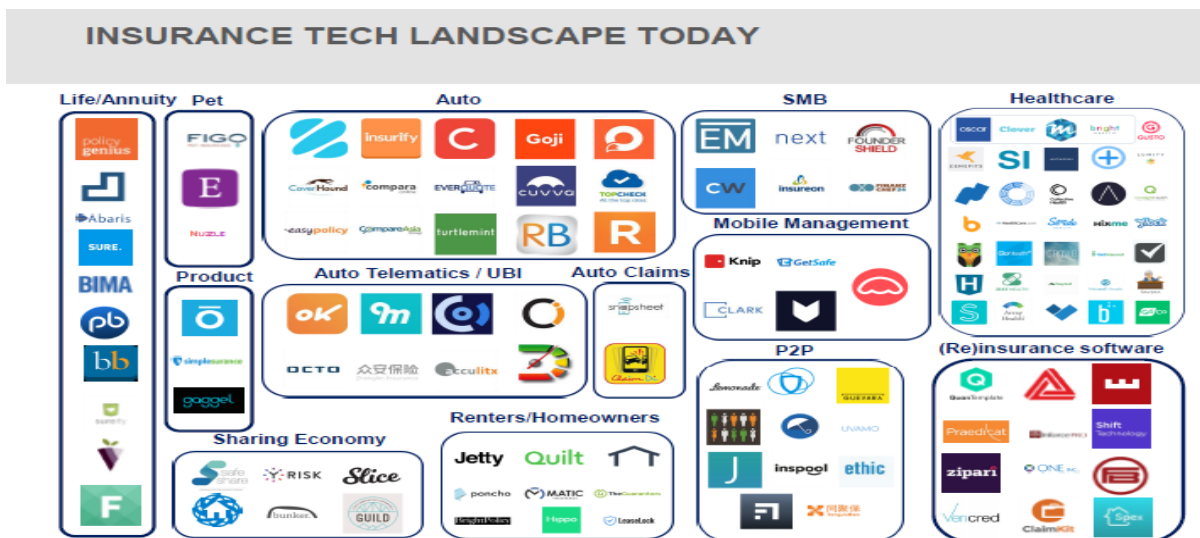
InsurTech across the business lines

37. One approach to categorize the new market entrants by classifying the start-ups according to its main line of business was made by CB Insights¹² that mapped the InsurTech landscape focusing on 11 categories:

1. Life/annuity: Private start-ups providing distribution of life insurance products including term life and annuities, including Abaris and PolicyGenius
2. Auto insurance (split into distribution, usage-based insurance/telematics, and claims): Start-ups ranging from aggregators including CoverHound and Goji to white label auto claims apps (Snapsheet) to per-mile managing general agents like Metromile.
3. P2P insurance: Private peer-to-peer insurance and mutual-based start-ups include Lemonade, Guevara, Friendsurance, and others.

¹² Analysing the Insurance Tech Investment Landscape, CB Insights.

4. Small business insurance: Private tech companies serving as commercial insurance brokers and managing general agents to SMBs include Insureon, Embroker, and Next Insurance.
5. Insurance industry software/analytics/laaS: Insurance-specific software across the value chain providers range from BI and data-warehousing start-up Quantemplate to insurance fraud detection firm Shift Technology to re-insurance SaaS analytics start-up Analyze Re to claims inspection start-up Spex.
6. Mobile insurance management: Start-ups focusing on allowing consumers to manage and purchase insurance policies via their mobile device including Knip and GetSafe.
7. Product insurance: Companies insuring or tracking products — i.e. smartphones, laptops — for insurance applications.
8. Renters/homeowners: Start-ups providing distribution of renter’s insurance and homeowner’s insurance as well as lease default insurance programs.
9. Sharing economy: Start-ups working on new insurance products in coverage areas including short-term rental marketplaces and for sharing economy 1099 workers.
10. Health insurance: Across new carriers like Oscar as well as healthcare insurance start-ups targeted at individuals (Stride Health) and employers (Zenefits).
11. Pet insurance: Start-ups include Embrace Pet Insurance and Figo Pet Insurance.



Source: CB Insights, Analyzing the Insurance Tech Investment Landscape. 2016

d. InsurTech Disruption vs Collaboration

38. Insurance companies view InsurTech start-ups as competitors or disruptors. Three out of four insurance companies believe that some part of their business is at risk of disruption, while 90% fear losing part of their business to InsurTech start-ups¹³. However, they also see opportunities that the innovative solutions may bring. Many insurance companies are recognizing that these start-ups can also be partners, since the benefits of InsurTech collaboration are substantial (for example, obtaining early access and being the first mover advantage on disruptive technologies or gaining the ability to influence and shape the focus and strategy of the new start-up). Currently, there is more collaboration between InsurTech start-ups and incumbent insurance companies.

39. Even though insurers can create the internal structures that support innovation, most of them will have to enlist external resources in one way or another. Accordingly, they will need to assess the availability and compatibility of existing talent and determine how and where they can find what may not currently be available. In this sense, collaboration is an important











¹³ <http://www.pwc.com/gx/en/industries/financial-services/fintech-survey/insurtech.html>

opportunity. Given the enabling role InsurTech firms are playing, as well as the challenges facing the established insurance sector and the barriers to entry for new businesses seeking to act alone, collaboration could result in mutual benefit – for the insurers and for customers.

40. According to a PwC report¹⁴, insurance companies are taking the following approaches for embracing InsurTech:












- *Exploration* – savvy incumbents are actively monitoring new trends and innovations. Some of them are even establishing a presence in innovation hotspots (e.g. Silicon Valley) where they are learning about the latest developments directly and in real time.
- *Strategic partnerships* – some incumbents partner with start-ups and build pilot solutions to test in the market. Ensuring a design environment (“sandbox”) helps boost creativity and also provides tools and resources for designing potential prototype solutions.
- *InsurTech involvement* – incumbents’ involvement in start-up programs such as incubators, mechanisms to fund companies, and strategic acquisitions may result in insurers’ readiness to address specific problems, especially those that otherwise might not be tackled in the short term.
- *New product development* – involvement in InsurTech could help incumbents discover emerging coverage needs and risks that require new insurance products and services. Accordingly, they can refine – and even redefine – product portfolio strategy.

41. Some examples of venture investment funds of prominent insurers are AXA, Aviva, Allianz, American Family, MassMutual, Transamerica and Ping An, which have made significant investments in InsurTech start-ups that can help them reduce costs and risk and capitalize on new markets.

Firm	Stated corporate venture areas of interest/focus
	*Connected world, data-driven insight, insurance innovation*
	*Fintech, connected car/smart home, data & analytics, cybersecurity, digital health*
	*The Internet of Things (car/home/health), data and analytics, innovative customer experiences, distribution i.e. new sharing economy platforms*
	*Enterprise software, financial technology, insurance technology, innovations in travel, health, and auto verticals*
	*Next generation vehicle products, connected home products, sharing economy, insurance innovation*
	*New insurance business models, Internet of Things, cybersecurity, energy, big data/analytics*
	*Underserved risk markets, innovative approaches to risk underwriting, financial technology with application to risk underwriting*
	*Finance, consumption, healthcare, auto, social network, and artificial intelligence*
	*Fintech, data analytics, cybersecurity, digital health, and enterprise software*
	*Fintech/FinServ, Big Data/Analytics, Digital Marketing and Sales, Social Media, Enterprise IT, Content and Publishing, Mobile*

Source: CB Insights, Insuretech Connect 2016

¹⁴ Opportunities await: How InsurTech is reshaping insurance, Global FinTech Survey, PwC, June 2016

INSURANCE DISTRIBUTION STARTUPS BACKED BY INSURERS	
Insurer	Insurance Distribution Startup
	<i>Lemonade</i> EMBROKER <i>Slice</i>
	<i>CoverHound</i> 
	<i>policygenius</i>
	<i>policygenius</i>
	<i>policygenius</i>
	<i>metromile</i>
	<i>CoverHound</i>
	<i>tröv</i>
	<i>Slice</i>
	<i>metromile</i>

Source: CB Insights, Analyzing the Insurance Tech Investment Landscape. 2016

5. Possible scenarios for the future and changes to the insurance landscape and supervisory approach

5.1 Framework for the scenario analysis

42. As highlighted in Sections 3 and 4 there are a significant number of drivers and potential applications of technological innovations that could change the insurance industry. In most cases the speed and scale of change will be determined through complex interactions between societal trends, technological developments, government legislation (& possibly incentives), insurer strategies as well as regulators. In addition, given the scale and divergence of the new technologies, any historic trends based on extrapolating previous technological innovations on the insurance industry, are likely to provide little to no meaningful basis on which to project future impacts.

43. In light of these uncertainties and complexities an analytical scenario-based framework is used that allows supervisors to visualise and explore the regulatory implications on the insurance market. Central to this scenario framework are the following three building blocks:

1. *Scenario context: Products & technology:* Scenarios need to be grounded on specific technologies and specific insurance products to provide context and ensure meaningful discussion on likely outcomes and supervisory consequences;
2. *Scenario diversity:* Scenarios need to be sufficiently diverse to allow supervisors to explore and consider consequences of extreme but nevertheless plausible outcomes – that considers not only market disruption, but the potential for displacement;
3. *Scenario output:* Scenarios need to consider the possible implications for supervisors both at a broader macro perspective, as well as at the individual firm level (micro-supervision). Understanding the required output will inevitably dictate the level of detailed required for each scenario.

Each of these areas is explored in more detail below:

Scenario context: Products & technology

44. The current areas of focus for technological developments largely mirror the size of the different insurance markets. In 2014 motor, health and property represented three quarters of non-life premiums in the EU¹⁵, and according to McKinsey these lines represented over 80% of the innovations¹⁶. For each of these products there are technological developments that have the potential to change / disrupt parts of the insurance value chain – from interacting with the customer, assessing the underlying risks, through to policy administration. The products and technologies included in the scenario-based approach are: Motor insurance and the impacts of telematics and usage based products; Health insurance and the impact of wearable technology and Property insurance, the impact of the internet-of-things and the connected home technology. In addition, two additional technological developments have been added that do not relate to a specific product, but have potential application across several products: DLT and Big Data / Artificial Intelligence.

¹⁵ <http://www.insuranceeurope.eu/sites/default/files/attachments/European%20Insurance%20-%20Key%20Facts%20-%20August%202015.pdf>

¹⁶ McKinsey presentation, “Insurtech: a Threat that Inspires”, Basel, 11 October 2016

Scenario diversity:

45. In designing the scenarios a balance needs to be struck between selecting a large number of scenarios, thereby allowing the consequences of the most important interactions to be identified, and a smaller number of scenarios, that ensures sufficient level of depth of analysis. Three scenarios were selected that illustrate the more extreme state as to how the insurance market may evolve. In doing so, there is no specific probability associated; instead these are used to assist in exploring the different supervisory consequences. The three scenarios are:

- *Scenario 1: Incumbents successfully maintain the customer relationship*
- *Scenario 2: Insurance value chain becomes fragmented; Incumbents no longer in control*
- *Scenario 3: Big technology firms squeezing out traditional insurers*

Scenario output: Supervision

46. Finally from a supervisory perspective for each scenario a view is expressed on the following aspects relative to the current market environment:

Macro / sectorial perspective:

- Competitiveness: number of insurers in the market
- Consumer choice: number of products available
- Level of interconnectedness: with regards to both capital and services provided (i.e. level of systemic risk)
- Ability for regulatory oversight: the extent to which risks are within the regulatory perimeter

Micro / firm supervisory perspective:

- Business model viability: this will consider viability based on the current insurer business models, and an assessment of the impacts on each component of the insurance value chain (i.e. product development, marketing, distribution, underwriting, policy/claims administration)
- Conduct of business: this will consider the potential consequence towards treating customers fairly, and the potential for uninsurable consumers
- Supervisory oversight: is the current information reported by individual insurers sufficient to identify adverse developments / risks

5.2 Description of the current market

5.2.1 Property Insurance / Connected House

47. The property insurance market is a very significant part of the whole non-life insurance market. Though generally not explicitly considered legally compulsory, it is indeed frequently in practice compulsory to rent an apartment or get a mortgage, and moreover the nature of the risks reduces the opportunities and relevance of self-insurance (strong severity potential).

48. Incumbents draw a significant part of their turnover from this historical market, frequently in combination with the motor insurance market.

49. Banks have gradually invested this market during the last thirty years, at first essentially in partnership with incumbents for quite standardized products. They now represent a significant part of the market, but not as significant as their part in life insurance.

50. In view of the complexity of the risks (combination of fire, theft, water leakage, frost, etc...), possible accumulations incurred in case of natural events (flood, subsidence, earthquake, storm) and of the rather strong competition - low margins on high volumes -, this market is very concentrated, with mainly insurers or bank-insurers of important size.

51. Regarding the distribution side, there has been during the last fifteen years the development of new intermediaries: online comparators. They are however more dedicated to the motor insurance market, as it is more pulled by the price criterion than the Property market where the damage to the property shows a more emotional component for the customers, making the quality of service, financial soundness of the insurer, all the more important.

52. The claims settlement may be either managed in house, or delegated to service providers - sometimes created through market initiatives - with also existence of compensation schemes facilitating the treatment of the very small claims (water leakage for example). The insurers and bank-insurers of important size which represent the major part of the markets are generally looking for solutions to optimize their processes of risk selection, underwriting, pricing and claims management, the low technical margins generally incurred on these products requiring these optimizations. This historically incited them to explore solutions proposed by technology, with however the limitation of the IT legacies, and they now wish to exploit the digitalization of their processes to improve them, in terms of costs as well as for the customer contact quality.

5.2.2 Motor Insurance / Telematics / Autonomous Car

53. The motor insurance market is a very important market, if not the main one in non-life insurance. There are third party liability and damage guarantees - which can be combined with theft and engine failure for example.

54. For jurisdictions in which the third party liability for motor vehicles is compulsory, the price criterion is the deciding factor, and it is a very competitive market on which the intermediaries already use the internet opportunities, for instance for Price Comparison Websites that have gained large market shares during the last decade.

55. In terms of risks, they are technically complex, with a high diversity: personal injuries (big), material damages (accumulations), natural events, theft, small damage (broken windows, other)... which led to multiple partnerships with experts, repairers, as well as compensation conventions between insurers themselves, and the development of acute legal skills for the biggest claims.

56. It is a rather promising area in terms of technological tools usage for prevention and underwriting. Technology can also add value to the assistance services. These characteristics already strongly appeal to the incumbents.

5.2.3 Health Insurance / Connected Lifestyles

57. The health risk for individuals can be split into: a basic state coverage, additional coverage via, for instance, employers; another coverage purely private - generally aimed at adapting the coverage to the risk profile of the individual and his family -, and self-insurance.

58. The respective shares of these different schemes are quite diversified according to the country, generally linked to the history and to the principles of state intervention, or of collective approaches in the coverage of risks.

59. This makes it difficult to draw a general picture of health insurance markets in terms of structure, but health risk per se is particularly sensitive for people, especially as it interacts with ethical issues (Bio-ethics, medical secrecy, genetics, illegal medicine practice). These different subjects are often linked to the development of opportunities to improve prevention, pricing and personal services associated with health insurance. Therefore the innovations will depend on the way different countries deal with these subjects.

5.3 Scenario analysis 1: Incumbents successfully maintain customer relationship

60. Under this scenario the insurance value chain remains essentially with the (re)insurers. Product development, distribution, underwriting, policy & claims administration and customer interaction is either in-house or out-sourced by the insurer. From the customer perspective the insurer continues to be the key provider. This scenario may be the result of natural, social, regulatory or capital barriers to the entry of InsurTech start-ups unrelated to traditional incumbents. Through acquisitions, corporate ventures or internal innovation initiatives, incumbents can achieve to stay in the front line for the consumer.

Impact on the market

61. A selection among insurers in general can be expected: global companies (high level of capital) and those with more tech-savvy structures with more flexibility are likely to have the upper hand. In general less competitiveness is expected.

62. There is likely also going to be a selection among InsurTech start-ups: they must help to attract and retain the insurer's target customer.

63. Insurers will try to maintain the customer relationship transforming its business models around monitoring, prevention and for example energy saving.

64. In motor insurance, for which autonomous vehicles and telematics become increasingly important, insurers are expected to work together with manufacturers. As a consequence, there will be an increasing volume of individual data collected and kept by the insurers, causing the customer relationship to be more dependent on trust.

Implications

65. The fact that traditional insurers maintain their positions does not mean that significant changes in the insurance business will no longer occur. In general, the expected implications are as follows:

- a. **Competitiveness:** Inserting technology into the insurance value chain tends to enhance processes that have high-impact on premiums such as pricing, risk selection, and fraud detection, which translates into competitive advantages in the first place. Those incumbents with greater difficulty in adapting to the new scenario will suffer from pressure on the profit margins and may come to succumb. More tech-savvy insurers with more flexible structures and capable of managing the legacy in terms of information technology tend to excel and remain in the market. **In the medium term, competitiveness tends to be reduced.**

- b. **Consumer choice:** A natural consequence of expanding the use of data for product formatting, which is a consumer demand, is the individualization of insurance. The adverse effect is the reduction of price comparability, which could reduce the choices. The fact that the processes are still under the control of traditional insurers tends to minimize this effect, but not to the point of canceling it. **In this sense, there should be a slight reduction of possible choices.**
- c. **Level of interconnectedness:** There is a special issue in this point regarding the possibility of an increase in outsourcing of the insurance value chain processes. The formation of highly captioned InsurTech start-ups and the establishment of partnerships with several incumbents can lead to concentration risks that should be monitored. One example is the possible adoption by incumbents of a limited number of technology platforms for telemetry in motor insurance or the diffusion of software-as-a-service. **Therefore, it could increase the level of interconnection among market players due to technological concentration.**
- d. **Ability for regulatory oversight:** In this scenario, considering that to bring a new product to market, customer-facing product distributors will rely on insurers' licenses to issue policies, as it is easier to obtain the appropriate licenses required for conducting FinTech activities under the label insurer, **the licensing process shall remain unchanged.**

Regulators will have to develop expertise and new skills, to identify and mitigate technological risks, to verify technological neutrality, to identify gaps, to propose strategies and rules. It means exploring how to work with the market to promote innovation on secure bases. In the same way comes the need to attract and retain talents to catalyze the development of InsurTech innovations. **Regulatory activity tends to become more challenging** and supervisors are likely to be behind market developments and in regulating FinTech activities. However, **the lower market fragmentation in this scenario may facilitate opportunities for joint learning in controlled regulatory environments.**

- e. **Business model viability:** with the tightening of the margins, insurers will have to seek new profit sources. The insurer of tomorrow will be one that can transform its business model around prevention and become a prevention specialist. New prevention services charged on a subscription basis will likely be a new source of profit for insurers. **This need to adapt to new business models will reduce the number of market participants.**

By increasing the efficiency of insurers' back office processes and systems, there is potential to enable insurers to operate with reduced premiums at larger scale. In a cyclical effect, **the reduction of premiums can endanger the sustainability of business models at first, until there is accommodation between risk and financial return, reducing the number of market participants.**

National and international regulations on the sharing of data and data privacy will have a large impact on costs that will be involved in company's compliance costs and how insurers will be able to effectively use consumer information. This will affect the ability of some insurers to adapt to the new standard of products and reduce the number of participants.

- f. **Conduct of business / consumer protection:** In this scenario of increased visibility of traditional brands and tighter margins, insurers will increasingly be concerned about enhancing interactions and building trusted relationships. As an industry that has traditionally focused on distribution through brokers and financial advisors, **the focus on customer experience can bring incumbents to increase efforts in monitoring the customer relationship and treating customers fairly.**

- g. **Supervisory oversight & prudential requirements:** The major concerns with respect to supervisory oversight and prudential requirements are related to new players' market entry and fragmentation. From the perspective of this scenario there will be no significant changes.

5.4 Scenario analysis 2: Insurance value chain becomes fragmented; Incumbents no longer in control

66. Under this scenario specialist technology firms have successfully established a customer relationship that increasingly considers insurance as a reducing component of other services provided. Sophisticated data analytics across multiple platforms / customer interaction points is carried out by the customer interfacing technology firm, leaving the insurer to focus on claims handling. The insurer continues to be the ultimate risk carrier, but is increasingly marginalised with many products being white-labelled. Customers may no longer know (or care) who their insurer is.

Impact on the market

67. In motor insurance, technology firms working together with motor manufacturers could increasingly interact with the consumer – providing vehicle and other life-style choices (increasingly infotainment in vehicles). Under this scenario insurance could be sold together with the product (i.e. the vehicle) or as part of infotainment service package. Insurers would deal with these technology firms to obtain the insurance risks embedded within the service. Under the worst scenario (for insurers) technology firms only provide the minimum necessary claims data.

68. In property insurance, technology firms would provide the necessary service of an overall security life-style package for the consumer. This could cover anything from boiler maintenance to on-demand films and music. Under this scenario the service could include attaching monitors to pipes to assess risk of freeze or on cookers for gas leaks. The insurance product is increasingly marginalised reflecting the reducing level of risk.

69. In health insurance, technology firms provide the necessary service of an overall package that promotes an active healthy life-style for the consumer. This could cover anything from providing fitness programmes, recommending recipes to providing traditional medical health insurance related check-ups. Under this scenario the service relies on monitors worn by the customer (“wearables”) to reduce the potential insurance risk. The insurance product is increasingly marginalised reflecting the reducing level of risk.

Implications

70. Potential implications arising from this scenario are:

- a. **Competitiveness:** As insurance products become embedded in services or products, the customer demand will be driven by the service provided rather than the insurance product. This dynamic will increase for products where technology is expected to significantly reduce the risk – hence the overall proportion of the consumer wallet relating to insurance reduces even faster. Under this scenario the customer has less incentive to shop around and technology firms are likely to minimise insurance partners to manage costs. **As a result competition is likely to reduce.**

As the insurance product increasingly relates to more sophisticated technology it could ultimately favour global insurers that have a global reach, ability to write in multiple jurisdictions and take a longer term business relationship view (long term business partners will be key). **Again this would suggest that competition is likely to reduce as smaller insurers are squeezed out.**

- b. **Consumer choice:** As insurance is embedded in a service the ability to compare insurance products may fall significantly. In the extreme case there is a possibility that the service provider does not offer an alternative insurance. However, even where consumers have the possibility to shop-around, the increasing customisation of technology to individual requirements is likely to reduce the comparability of products – **thereby reducing overall consumer choice.**
- c. **Level of interconnectedness:** The level of interconnectedness is unlikely to significantly change due to the fragmentation of the insurance value chain. Rather any increase in the level of vulnerability at a sector level is likely to arise if insurers and technology firms use similar platforms (e.g. cloud based or software providers). **No material change expected as a result of fragmentation.**
- d. **Ability for regulatory oversight:** As the insurance value chain fragments, the customer facing entity will differ from the risk taking entity. This may make it more difficult for regulators to identify and understand trends relating to changes in product design and the implication on prudential requirements. This is likely to be more challenging in jurisdictions where conduct and prudential regulation is not carried out by the same institution. **Ability for regulatory oversight is likely to become more challenging.**

Assuming that fragmentation is likely to favour larger global insurers (i.e. using their scale to maintain partnership deals with the large technology firms) this could lead to a reduction of domestic insurers. With global insurers increasingly gaining market share, there is potential that material decisions such as strategy, product design and exposure limits will increasingly be decided outside of the country jurisdiction. In addition, significant processes such as pricing, claims handling and marketing could be carried out in different geographical areas as well as different legal entities. **In these circumstances regulatory oversight and influence may significantly reduce.**

- e. **Business model viability:** Fragmentation of the insurance value chain is likely to result in a higher and more rapid contraction of the overall insurance premium. Under this scenario ancillary income, which currently benefits insurers, will be expected to benefit technology firms. The faster the reduction in market premiums the greater the risk of business model viability as many firms may fail to adapt. In the longer term it would be expected that the insurance industry adapts to reflect the new norm, and use the data available from technology firms to re-price risk to maintain an adequate level of return. **In the short/medium term expect business model resilience to reduce.**
- f. **Conduct of business / consumer protection:** As the value chain fragments, insurers will be reduced to price takers rather than price setters. In addition, as their interaction with the customer diminishes, insurers may not know what the actual premium being charged is – particularly in cases where it is embedded within a service offering. Under these circumstances understanding the extent of any cross-subsidies and whether the consumer is being treated fairly is likely to be less transparent. Specifically, the regulators ability to understand how the technical price of an insurance product is translated to a final price that is charged to the consumer will be more difficult to evaluate where different firms are involved within this process. In addition, as insurers become one or more steps removed from the customer it will be harder for them to establish whether the product is best suited for the customer. (i.e. demonstrating that requirements around Treating Customers Fairly is met may become increasingly difficult). **Expect reduced transparency.**

Implications for consumer protection typically arise as a consequence of Big Data. Specifically who will own and analyse the Big Data and for whose benefit (firm or customer). A firm seeking to minimise the claim experience has different vested interests than a firm that is concerned with customer engagement. Fragmentation of

the insurance value chain is likely to increase risk of disputes between insurers and technology firms – particularly where the technology firms are the priced setters.

- g. **Supervisory oversight & prudential requirements:** Fragmentation of the insurance value chain should not in itself change the underlying nature of the risk. However, the fragmentation is likely to lead to reduced share of the consumer wallet for insurers (as ancillary income and other services are expected to be taken by technology firms). Under this circumstance the risk profile could become more volatile – stable profits in normal years followed by very extreme results when exceptional losses occur. The level of volatility is expected to increase as the ability of the insurer to cross-subsidise with other parts of the insurance value chain no longer exists. **The capital regime could become at risk of under-estimating insurer capital requirements if not recalibrated to reflect the changing market structure.**

As insurance is increasingly tied to underlying services and reliant on partnerships, actual business volumes could become more volatile - i.e. insurance premiums could significantly differ depending on the ability of the insurer to win or lose a particular partnership deal. **These developments may make industry results and capital requirement more volatile on average.**

As the insurer becomes increasingly removed from the customer, the ability to understand and react to consumer trends will be harder. **This has implications for supervisory oversight and the ability of regulators to identify and monitor potential adverse trends.**

As the insurance value chain fragments, an increase in profit commission arrangements would be expected, whereby those firms that own the customer relationship benefit from better experience. Under these circumstances understanding the level of loss absorbency will be critical to determining regulatory capital requirements. **Regulatory capital requirements are expected to change to reflect changes in payments impacting insurers' ability for loss absorbency (e.g. profit commissions is likely to increase in importance and is typically not well considered within current regulatory rules).**

5.5 Scenario analysis 3: Big technology firms squeezing out traditional insurers

71. Under this scenario Big Technology Firms (BTF) provide products that seamlessly integrate the insurance element, thereby capturing the entire insurance value chain. Premiums are embedded within other services or as part of a consumer lifestyle package. Sophisticated data analytics and the increased prevalence of connected devices allow BTF to develop enhanced claims prevention measures, thereby allowing them to undercut and to be even more competitive than traditional insurers.

Impact on the market

72. In property insurance, BTF use their modern computing capacities and digital natives IT systems, as well as a “trust capital”/“brand recognition” of a growing part of the population - millennials for whom the GAFAs and other actors of new economy are often more trusted than incumbents – to sell insurance products. In some cases it could not be much discernible from the other services that they propose. They might even use financial strength and their skills in data mining and data management to carry out the insurance risk themselves.

73. By applying the same reasoning as the bankinsurers did in the past, BTF would begin by distributing, then partnering with incumbents in joint ventures, then being strongly reinsured

players to finally benefit from a position of leading player on several national markets to even mutualize the risks for which national insurers have so far to resort to the reinsurance market.

74. The question of the timing of these evolutions - even of their realization - is probably not linked to a specific non-life insurance market. BTF are generally thinking globally - even if they would probably first test their concepts in markets where the regulatory barrier is believed to be lower before extrapolating. Moreover they could begin with other risks than Property.

75. Beyond the GAFAs, it is possible that a technological actor specialized in domestic connected devices, and seeing a benefit of its products in terms of prevention or risk assessment that it does not succeed in "selling" to traditional insurers, decides to be the risk carrier itself. Although nothing can be absolutely excluded, it is still difficult at this stage to imagine a scenario of this kind revolutionizing the Property insurance market.

76. Even more than for the property market, the incentives for GAFAs to enter the motor insurance market could take a significant time to be effective, since technical margins in this very mature market are quite low and require mobilizing diversified and costly skills – technical, IT, marketing, operations - to reach the critical size necessary in terms of profitability.

77. This does not mean that GAFAs will not use their tools and their brand strength to sell this type of products, but it seems for the moment more likely that it would be in partnership with incumbents. The transition to a phase where they would carry the risk and manage claims could be in a later phase – apart from the specific case of P2P insurance schemes.

78. However, once the autonomous car is actually used on a large scale, the companies producing and selling it could use their knowledge of customers and risk (this time from a technical point of view) to capture what would be the car insurance market tomorrow: a smaller, but with lower losses, and less volatility.

79. The other possibility would be that the collaborative economy ends up altering the traditional situation of a vehicle owned by its driver who uses it only for his own needs, to move to a model of collective sharing of this vehicle, thus changing the way risk is assessed. In this context, a platform of significant size belonging to this market could be tempted to use its huge user database – and associated behaviour knowledge - to efficiently sell and even eventually capture the whole value chain. Moreover they could wish to do so just to be able to tailor the insurance products to the needs of their clients if their incumbent partners do not accept to do so.

80. Apart from the regulations on health, genetics, bioethics, illegal practice of medicine mentioned above, GAFAs-type technological players are quite naturally well placed in the field of health insurance. Indeed, via social networks and connected health objects (wearables, ingestibles, etc.), which are usually interconnected with these social networks - they get at the same time a precise knowledge of behaviours and parameters influencing the health risk, and can even contribute to its prevention - cf. assessment of probability of certain pathologies via high quality selfies of people.

81. The degree of trust from people in these actors for such sensitive subjects appears to be an obstacle for older generations, but the question remains unanswered for millennials more accustomed to these brands than to traditional insurance companies. It is probable that GAFAs' success would depend on the progressivity of entry into this universe so that they are not perceived as excessively intrusive and rejected even by their usual clients.

82. Where all the regulations would be adapted to these new value propositions, it seems that health insurance could be integrated into a "lifestyle" package offered to people on platforms that would not only offer products or services but offer these packages accompanying them on all dimensions of their existence.

83. In this context, the GAFAs mastery of information technologies could improve quality of services that incumbents fail to reach up until now. In addition, since health risks are

generally less volatile than other insured risks, they could indeed carry these risks with the support of reinsurers on peak risks (pandemic), and also partner external providers on operational issues – for instance linked to the interconnexion with State systems.

Implications

84. **Competitiveness:** BTF have an advantage over traditional players either by their strong presence in terms of social networks, which presents a high premium to the market leader, or by their link with the product (producer of autonomous vehicles). In both cases, traditional small and medium-sized insurers appear to be poorly adapted to cope with this competition, notably in terms of information systems and additional services dimension, and a significant reduction in the number of players is expected.

85. However, other players than those who would disrupt car insurance could possibly enter this market, for example via home automation or anti-theft companies, who would decide to diversify their activity towards home insurance. It seems however likely that they would remain on the distribution part rather than carry the risk for most of them.

86. If abstracting from Peer-to-Peer models that could be promoted by technological players specialized in social networks, the required new services proposed to clients, and the complexity it generates, would require investments from incumbents that could lead to a reduction of the number of players. Another possibility would be that the platforms specialize in these value-added services but do not carry the risk itself. The competition would in this case also be reduced, as the tech platforms would only partner with some of the biggest incumbents.

87. In force regulations or collective agreements may grant unwanted protection to a certain number of players due to barriers these form new players, which in a sense would maintain a greater diversity of insurers but not necessarily competition because their highly prescriptive dimension reduces consumer choice at the end of the day.

88. **Consumer choice:** Despite this reduction in the number of players, as one of the strengths of GAFAs lies in the use of data and new technologies to make "tailor-made" products, the variety of products could increase significantly.

89. On the other hand, as far as the inclusion is concerned, two contradictory effects would be at work, simultaneously: a greater inclusion by the use of means of cheaper marketing, selling and managing tools and a reduction of the risk via increased prevention - with the extreme case of the autonomous car. But potentially an exclusion by the price of certain profiles for which the risk would be measured more precisely than today and less mutualized.

90. The stronger link between real activities (home automation, security of dwellings and people) and insurance could give rise to an abundance of strongly differentiated offerings, which would therefore increase the choice of consumers.

91. It is more on the service dimension than on the insurance product itself that an increase of consumer choice could take place, the products corresponding naturally to a partial or total reimbursement of the health expenses borne by the insured after what state systems pay.

92. **Level of interconnectedness:** The fact that platforms generally use more modern financial services, notably payments, or the fact that, like these services, the insurance business is housed in a cloud - and thus sensitive to the same cyber-attacks - can also increase interconnection with critical financial services, all the more so if some of these services are themselves interconnected with services related to housing. This raises the crucial issue of security against the cyber-attacks of connected objects.

93. GAFAs operators would use more modern financial services to optimize premium collection, compensation, and thus increase interconnection with innovative financial services.

94. **Ability for regulatory oversight:** In the case of autonomous cars, the regulations will have to adapt to an environment without identified responsible drivers and decide on the sharing of responsibility between owner and manufacturer in the event of an accident.

95. Apart from this, the adaptation of legal frameworks to an approach more tied to the use than to the possession of the vehicle may prove necessary, or in any cases its clarification.

96. In the case of platform-type models, which will often produce solutions more related to use than to vehicle ownership, the considerations will be more technical than regulatory as such. An important issue will be the protection of consumers in an environment that tends to make the insurance product transparent to them, embedded in a global package, as well as protection of personal data and cyber security.

97. In health insurance, the regulation of this type of activity goes beyond the insurance field to cover very sensitive subjects – and its approaches are highly differentiated according to the cultures and histories of the different countries - such as genetics, personal data, bioethics, exercise of medicine. It is more through the strong interaction with these subjects that the use of new technologies in health insurance by technological players implies that regulatory topics will be put on the table rather than questions relating to insurance in the strict sense - apart from peer-to-peer insurance otherwise dealt with.

98. **Business model viability:** For traditional players this scenario would certainly be an important stress on the viability of their business models, likely leading to mergers and absorptions (at least) - and therefore to the reduction of the number of insurers. These mergers are moreover generally costly and temporarily degrade the agility of the information systems that would be needed to play on an equal footing with the new players.

99. Some incumbents are willing to anticipate this global evolution of the insurance market by strengthening their points of adherence with their customers, by proposing other services - financial, assistance, repair, prevention and participating in the collaborative economy etc. - in order to become themselves a reference platform for the car owner.

100. For the new players, the difficulty will lie in the management of the peak risks, which they can cede to reinsurers, and the need to develop partnerships with expert networks, assistance, repair and so on.

101. By reducing the cost of acquiring customers via the use of social networks and the notoriety gained elsewhere, as well as management costs via an a priori more efficient computing, new players could offer products at highly competitive conditions which would be difficult to keep up with for traditional actors apart from market or legal mechanisms inherited from the past that can - temporarily and partially - protect their market share.

102. It is all the more true as risk management and pricing require less statistical skills and knowledge a priori than for more complex risks: it is possible to retro-engineer the pricing associated with different guarantees of existing insurers and to build up a reasonable pricing base without the availability of hard-won historical data on such risks.

103. The main risk will be linked to the cost of the legal litigations that would be supported in the context of the complementary services offered to the insured, or the use of their data for prevention and pricing.

104. **Conduct of business:** An important topic will be the use of customer data not explicitly related to insured risk, but which will eventually include a statistical relevance in predicting the risk (e.g. pricing via Facebook profile). An important issue will be the collection and use of customer data, not necessarily directly related to the insured risk, or at least not obviously at first sight. For example use of customer data to its disadvantage on the basis of its behaviours more or less risk averse in other areas than driving.

105. The asymmetry of information between the insured and the technological society could be very strong for the benefit of the latter, which will not only benefit from knowledge of risk-

pricing like today's insurers but also behavioural data. This asymmetry could lead to practices unfavourable to consumers, especially in an environment closer to the oligopoly for products sometimes confusing between insurance and other services.

106. **Supervisory oversight:** The BTF envisaged will generally be multinational, with systems and processes, notably IT, which will not recognize borders. Consequently, their supervision at national level would be complex, if only because of data present on a cloud whose servers are on another continent, with centralized pricing teams elsewhere. The national supervisory approach may also be a constraint on the development of these players as risk carriers.

107. Moreover, certain issues are related to other regulations which may make cooperation between insurance supervisors and other agencies specialized in data protection, medical ethics, cybersecurity, etc. more complex (cybersecurity, data protection, protection of the mixed consumer between insurance and other services). Reinforced co-operation between national supervisors would be imperative in order to supervise such complex and sprawling projects.

5.6 Distributed ledger technology

108. According to the WEF report “The Future of Financial Infrastructure”, DLT is one of many transformative new technologies that will shape future financial services infrastructure. The WEF identifies six key value drivers of DLT:

1. Operational simplification: DLT reduces / eliminates manual efforts required to perform reconciliation and resolve disputes.
2. Regulatory efficiency improvement: DLT enables real-time monitoring of financial activity between regulators and regulated entities.
3. Counterparty risk reduction: DLT challenges the need to trust counterparties to fulfil obligations as agreements are codified and executed in a shared, immutable environment.
4. Clearing and settlement time reduction: DLT disintermediates third parties that support transaction verification / validation and accelerates settlement.
5. Liquidity and capital improvement: DLT reduces locked-in capital and provides transparency into sourcing liquidity for assets.
6. Fraud minimization: DLT enables asset provenance and full transaction history to be established within a single source of truth.

109. Regarding the insurance business, DLT will transform the way information is transferred and verified in most areas of the insurance value chain, with the opportunity for all possible firms to adopt. However, DLT is still in its infancy with many firms and groups reviewing possible projects, applications, and use cases¹⁷, working jointly incumbents and new entrants providing early proof of concept, focusing mainly on: creation of immutable insurance claim records, development of asset provenance to assist in risk profiling and claims processing and P2P insurance.

Impact on the market

110. The existing insurance products that may be potentially impacted by DLT are retail insurance, commercial insurance and reinsurance, mainly in non-life insurance products.

¹⁷ B3i and R3 are just a couple of examples of consortiums trying to move forward with DLT.

Regarding the insurance value chain, the main activities that may be potentially impacted by DLT are: product development, distribution, underwriting, claims processing and fraud prevention.

111. For product development, DLT could be applied in new business models like Peer to Peer insurance, where the insurer could be just another node of the distributed ledger, playing a major role by guaranteeing the financing of the system.

112. In the case of distribution and underwriting, DLT could be used to efficiently store verified records such as ownership details and transfers, claims history, and other exposure information that may be used in the procurement of insured data for the use in underwriting through asset registries or the like. The potential impact would reduce the time needed for underwriting risks, including the verification process. The adoption of DLT in the distribution process may lessen the reliance on agents and brokers as an intermediary in the information gathering phase as well.

113. As for the claims processing¹⁸, DLT may enable reduced administrative costs, lessening the need for adjusters and allow faster claims payments. This may reduce the overall expense of adjusting and settling through products such as smart contracts on a distributed ledger. In addition, the Internet of Things (IoT) products may assist in verifying an actual claim occurred and is eligible for payment/reimbursement. If claims efficiency was drastically standardized through the use of DLT, the value proposition of different insurers could be minimized, causing the barrier to entry to become even lower than it is today.

114. Regarding AML and fraud prevention, DLT provides an immutable record that could streamline KYC processes and reduce overall fraud levels by eliminating the possibility of duplicate claims or claims for events that did not occur.

Implications

115. Since DLT may affect all areas of the insurance value chain, its impact and risks are similar in all possible scenarios. Under this context, for this report, the possible impact of DLT is similar under all scenarios. In general, the expected implications are as follows:

- a. **Competitiveness:** DLT could lower the barriers to entry and allow non-traditional companies like BTFs to compete with current insurers. In the longer term, the players that remain may be the ones that apply DLT for risk selection, claims management and fraud prevention.
- b. **Consumer choice:** Consumer products may become more standardised due to operational issues of smart contracts. However, different types of product offerings may arise and become real time offerings through DLT and other devices such as telematics and IoT.
- c. **Level of interconnectedness:** The level of interconnectedness could increase since DLT platforms and protocols may need to be standardised for the entire financial sector.
- d. **Business model viability:** Insurers that adopt DLT may see cost reductions and improved efficiencies that could increase their competitiveness and enhance viability in the long term.
- e. **Conduct of business / consumer protection:** DLT might generate legal issues depending on local legislation on contract legal value. Issues around consumer protection may arise such as resolving disputes whether a smart contract corresponds to what has been sold to the client.

¹⁸ A detailed example of analysis on DLT impact on P&C Claims Processing can be consulted in the WEF report “The future of financial infrastructure”.

- f. **Data ownership:** In current Blockchain technology, data is fully transparent in the DLT, therefore it would be difficult to say who owns it. In the future, some cryptographic anonymization algorithm could be devised, but it would cause other issues (AML and performance)
- g. **Supervisory oversight & prudential requirements:** Capital solvency and customer protection are still going to be key issues even in a blockchain environment (except for P2P schemes). DLT may increase liquidity risk if proper controls are not put into place due to increased claims efficiency and the use of smart contracts. DLT may increase AML risk depending on the structure used.

5.7 Big Data and Artificial Intelligence

116. The use of Big Data comprises the collection, processing and use of high volumes of different types of data from various sources, using IT tools (powerful processors, software and algorithms), in order to reveal patterns or correlations, generate ideas, solutions or predict certain events or behaviours in a more accurate and timely manner.

117. Artificial Intelligence (AI) is “intelligence” that is not the result of human cognition¹⁹. AI is the result of exponential growth in computing power, memory capacity, cloud computing, distributed and parallel processing, open-source solutions, and global connectivity of both people and machines.

118. AI has many topic areas²⁰ that add to the notion of “intelligence”, and Machine Learning (ML) is just one topic area of AI. ML is the science and engineering of making machines “learn” by finding patterns in data in an automated manner using sophisticated methods and algorithms²¹.

119. Together, AI and ML aim to embed human intelligence into machines, enabling systems to learn, adapt and develop solutions to problems on their own.

Impact on the market

120. All the existing insurance products as well as all business lines may be potentially impacted by the use of Big Data and AI. Likewise, all the activities of the insurance value chain could be impacted, such as product development and pricing, underwriting risks, claims processing, preventing fraud, undertaking AML/customer identification, increasing internal efficiency, among many others.

121. For underwriting purposes, AI and ML can help insurers and agents underwrite risk effectively, by using big data from customer that it has collected by multiple sources, many of them in real time. Through automation, pattern spotting and machine learning, AI can assist agents in sorting through information and identifying cases that pose higher risk.

122. As for distribution activities, digital advice could soon replace many functions of a typical independent agent. This technology can also improve internal processes and assist insurers in cutting down on time spent on traditional tasks. For the insurance industry, AI provides predictive consulting to provide better around the clock customer service. Whereas humans are unable to offer 24-hour support, AI systems like chat bots provide real-time feedback and insurance consulting to deliver quality service and improve the business’ bottom line.

¹⁹ <https://www.pwc.com/us/en/insurance/publications/assets/pwc-top-issues-artificial-intelligence.pdf>

²⁰ Source: PwC, AI in Insurance: Hype or Reality

²¹ <http://www.skytree.net/2015/08/06/driving-profitability-and-lowering-costs-in-the-insurance-industry-using-machine-learning-on-hadoop/>

123. Regarding claims handling, AI and automation allow insurers to cut down on claim processing times significantly and obtain cost savings. Tasks that once took months to finish are now accurately completed in the matter of minutes, opening the gate for insurers to focus on more complex and creative projects.

Implications

124. Since the use of Big Data and AI may affect all areas of the insurance value chain, its impact and risks are similar in all possible scenarios. Under this context, for this report, the possible impact of the use of Big Data and AI is similar under all scenarios. It is worth mentioning that the analysis of some possible future state is based on the preliminary assessment that has been made by the European Supervisory Authorities (ESAs) on the Use of Big Data by Financial Institutions²².

125. The ESAs consider that the use of Big Data has the potential to continue to grow and the capacity to use it may be a key determinant of competitive advantage in the future. The adoption of Big Data technologies may change the way financial services are provided. Tech firms may also expand their activities to provide financial services, by leveraging their own technical expertise, innovative and integrated platforms or extensive consumer data or loyalty among millennials. Many financial incumbents understand this reality and are well aware that Big Data related technologies are a potential threat as well as an opportunity for their sector. In general, the expected implications are as follows:

- a. **Competitiveness:** Insurers that use Big Data and AI may have benefits relating to increased revenues/lower costs derived from cost-effective processes linked to the exploitation of data and from access to a wider/more stable client base.
- b. **Consumer choice:** Consumers may have benefits in terms of better/innovative processes, products and services as well as more personalised products and services. However, consumers may experience a reduced comparability of financial services related to limited/unclear information and comprehension about the extent to which the offer/service is tailored to consumers and/or represents a personal recommendation.
- c. **Business model viability:** Insurers may face budget and human capital challenges. Errors/inadequacies of the Big Data tools or errors in algorithms design could be more likely to arise if tools are developed without the input of qualified staff. New skills, in particular data scientists or behavioural and social specialists, will be required, as well as the need to train staff and develop specialised expertise to be able to design algorithms, handle, analyse and monitor any decision-making process based on Big Data analytics.

Companies may also face higher costs regarding the collection of data or the establishment and maintenance of data centres to prevent IT-system breakdown or to recover from them (Disaster Recovery plan, data mirroring). These challenges may act as a barrier or be overwhelming for certain financial institutions and could lead them to exit a specific market.

- d. **Conduct of business/ consumer protection:** The use of Big Data and AI may bring potential benefits for consumers and financial institutions linked to improved detection of fraud and other illegal activities. However, there are increased risks related to flaws in the functioning of Big Data tools, as well as consumers having limited ability to correct information errors, challenge the use of data/decision-making processes or seek clarifications. Furthermore, there are other broader ethical considerations linked to the

²² Joint Committee of the European Supervisory Authorities Discussion Paper on the Use of Big Data by Financial Institutions: https://esas-joint-committee.europa.eu/Publications/Discussion%20Paper/jc-2016-86_discussion_paper_big_data.pdf

use of Big Data, such as the risk of penalising any deviations from what is deemed as the statistical/expected norm could push or coerce individuals into avoiding certain behaviours or contact with certain people or companies, or from visiting certain areas.

- e. **Data ownership:** Companies using Big Data should be mindful of the consumer protection requirements in their jurisdiction related to the processing of consumers' personal data, including how data is collected, from what sources, how well-informed consumers are about the processing and whether they consent to it. In particular, any processing of personal data must be lawful and fair to the consumers concerned.

New regulations on data protection, like the General Data Protection Regulation (GDPR) in Europe, establish stronger rights for consumers (access and correction of personal data, an explicit right to be forgotten, a right to object to data processing, the right to be informed when data security is breached or better information on firms' data protection policies, and data portability). The new rules provide more clarity on the due diligence that entities are expected to observe when dealing with personal data, they are likely to encourage the use of "big data" analytics, by using anonymised or pseudonymised data.

The protection of consumers' rights with regard to the processing of personal data also requires that appropriate technical and organisational measures be taken, both at the time of the design of the processing system and at the time of the processing itself, particularly in order to maintain security and to prevent any unauthorised processing

- f. **Supervisory oversight:** Sectoral financial legislation is in principle technology neutral and as such does not specifically deal with Big Data related matters. However, financial regulations include various prudential and organisational obligations relevant, while not drafted with Big Data technologies in mind, for financial institutions using Big Data technologies, such as: establishing and operating sound internal control mechanisms, effective procedures for risk assessment and effective control and safeguard arrangements for information processing systems; ensuring continuity and regularity in the performance of their activities; or ensuring that any reliance on a third party (outsourcing) does not impair the quality and the continuous performance of services. Another relevant issue will be the regulation of algorithms behind AI and ML.

6. Conclusions

126. Technological innovations and the changing expectation of customers have promoted InsurTech developments which are reshaping the insurance industry. Some innovations are being used throughout the insurance value chain, while others, like DLT, are still in a nascent phase in which it remains unclear to be seen how widespread will they be applied in the insurance sector.

127. Both innovators and incumbents are responding to the challenges. Global investment in InsurTech has grown during the last years, in which the most relevant investments in 2016 were made in start-ups based in US, Germany and UK. Even though InsurTech start-ups may be seen as competitors or disruptors, the collaboration between them and incumbent insurance companies may bring significant competitive advantages.

128. InsurTech innovations have the potential to deliver a wide range of benefits, in particular efficiency improvements, cost reductions, improved risk assessment, superior customer experience and greater financial inclusion. However, some of these innovations could also pose negative implications to the consumer and the financial stability of insurance markets.

129. Under scenario 1 - if market conditions remain such that incumbents successfully maintain the customer relationship - there will be significant changes in the business models adopted by market participants. In many ways the insertion of technologies and start-ups in the value chain of insurance will occur as a competitive differential and as a way to build a longer and trustworthy relationship with consumers. After some time of accommodation less providers are expected in this "new" market, those with more flexible structures who succeed in changing their roles around damage prevention, health monitoring and others.

130. Although there might be a reduction in price comparability and therefore customer choice, the incumbents are likely to increase customer focus from a business conduct perspective.

131. From a regulatory perspective, supervisors will be more challenged in keeping up with technological innovations. Their practices as well as regulations may be lagging behind. However, the lower market fragmentation may provide opportunities for joint learning in controlled regulatory environments.

132. In scenario 2 - assuming that the insurance value chain becomes fragmented and incumbents are no longer in control - insurance could become more embedded in other services or products. There will be a lesser incentive to shop around reducing competition. Also comparability will be negatively affected which will reduce consumer choice.

133. Business model resilience is expected to significantly reduce due to the fragmentation of the value chain and revenues moving to the technology firms. This will at a minimum apply in a transitional time during which insurers need to adapt their business models.

134. As increased fragmentation will lead to decreased transparency of the value chain, consumer protection may be negatively affected, challenging supervisors with responsibility for business conduct. The same will apply from a prudential perspective as key processes, such as pricing, claims handling and marketing are geographically fragmented and technical product complexities challenge the knowledge of supervisors.

135. In scenario 3 - if BTFs squeeze out traditional insurers - a first phase would be expected in which the BTF or GAFAs partner with incumbents and focus on what they know best, use their digital ease and the trust they would have successfully built amongst millennials to progressively capture big shares of the insurance market. Then, once they would have increased their knowledge about the insurance industry, they would progressively carry themselves the risks, which would also allow them the possibility to tailor the products to what their global marketing strategy would be, insurance being one of the multiple aspects of a

lifestyle package they provide their users with. This would therefore adversely affect traditional insurers that would progressively lose client ownership, and that is why a strategy currently observed in incumbents is to try and become themselves sort of a thematic community platform (around health issues, cars, etc.).

136. Supervisors could then have to manage the progressive end of activities from some incumbents (those not very digital oriented) while at the same time be confronted with the consumer protection issues raised by these new insurance distribution models – including data protection – as well as cyber-security risks stemming from their multinational data oriented models. Even if customers might benefit from having insurance products included in the user friendly environment they already enjoy, with many facilitating interconnections with their other services and goods, these are also the source of misselling, unethical use of data or even bioethics issues.

137. Regardless of which of the previous scenarios develop, the use of Big Data will impact all insurance business lines and processes. Its application for analysis and decision making through Artificial Intelligence (AI) will grow as connectivity of devices becomes widely adopted. For incumbents and innovators, the application of Big Data and AI is a significant competitive advantage. However, they will need to invest in preventing cyber incidents as well as invest in training or hiring specialised expertise for algorithms design and application. Authorities will have to establish regulations for protection of consumers' personal data regarding its collection, processing, correction and sharing, as well as in order to ensure that insurers have information security and data privacy policies, procedures, methods and tools aimed at protecting data from cyber incidents, breaches or unintended use.

138. Distributed Ledger Technology is still in an early phase where applications in insurance will differ by use case. The most impactful DLT applications will require deep collaboration between incumbents, innovators and regulators, adding complexity and delaying implementation. For supervisors, implementing DLT applications may require changes to existing regulations, standards of practice, and the creation of new legal and liability frameworks. Specifically, the implementation of smart contracts will require additional stakeholder alignment and governance considerations. For incumbents and innovators, implementing DLT applications may require to conduct cost-benefit analyses in order to determine its financial viability.

139. Under this context, insurance regulators and supervisors may face the following challenges in the near future:

- a. Understanding and evaluating technological innovations: Technological development is ongoing and often rapid and many innovations are still in a nascent phase. Supervisors need to understand how innovations work and are applied in order to ensure adequate assessment of new product and business models. In some cases, like DLT, understanding the true potential of an innovation requires not only research but also using the technology for real applications.

Supervisors need to establish guidelines for appropriate and responsible use of new technologies and to define under which principles innovations will be supported for the market. Identification of principles developed by other national and international regulators as well as issue papers and policy recommendations made by international organisations and standard setting bodies are relevant for this task.

Supervisors will also need to balance the risks of new innovations against the benefits for policyholders and the insurance sector as a whole, and consider how to create the proper environment to foster innovation for example through regulatory sandboxes or innovation hubs.

- b. Adjustments to Prudential regulation framework: Supervisors and policymakers will need to evaluate and where appropriate adjust their prudential regulation framework, in order to include the assessment and quantification of new risks (such as the use of

algorithms for underwriting purposes), changes in corporate governance framework regarding third-party collaboration with InsurTech companies, among others. There needs to be a proper understanding both in the insurer and the supervisor of the IT architecture and infrastructure used by the insurer and how this is addressed in the insurers risk management framework.

- c. Adjustments to the regulatory framework for conduct of business: FinTech innovations will have an impact on consumer protection and the extent to which customers are treated fairly. The technical infrastructure and applications used for maintaining customer relations need to cater for the fair treatment of customers and - for example in the use of AI and robo advice mechanisms – provide safeguards for advice and services that are suitable and affordable for the customer.
- d. Collaboration with other stakeholders: Collaboration and dialogue between stakeholders, such as supervised institutions, other market participants, academics, financial regulators and supervisors, as well as other authorities governing use of technology and communications are essential to address the challenges mentioned above.
- e. Adjustments to supervisors resources: Supervisors will need to examine if their supervisory tools and IT infrastructures need to be improved, since technological innovation also offer opportunities for supervisors to automate certain supervisory processes and compliance requirements. Additionally supervisors' staff may need new technical skills to understand in depth innovations and identify risks associated. In this sense, there is a need for supervisors to attract and retain talent with this skillset.

Annex 1: Overview of current technological innovations in Insurance

The most significant innovations, and their potential applications in the industry are:

1. Digital platforms (internet, smartphones):
 - a. Traditional players seek to improve the customer experience, leading the processes for the digital environment and seeking to reach new markets;
 - b. Gamification, application of game-design elements and game principles in non-game contexts, in this case, to increase the interaction with the user;
 - c. Servicing the "on demand" economy²³: InsurTechs whose focus is the provision of pay-per-use or period based products (e.g. short term insurance focused on online platforms like Uber and Airbnb, and the increasing property sharing culture);
 - d. Help on the claims process: InsurTechs offering services for taking over the claims process end-to-end for the customer;
 - e. Peer-to-peer (P2P) Insurance: Platforms allowing groups having common interests to negotiate coverage in "communities".
2. Internet of Things (IoT): The term IoT has been defined in Recommendation ITU-T Y.2060²⁴ as a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies. This means the internetworking of physical devices, vehicles, buildings and other items (also referred to as "connected devices" and "smart devices"), embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data.
3. Telematics / Telemetry: In the context of IoT, telematics involves telecommunications, sensors and computer science to allow sending, receiving, storing and processing data via telecommunication devices, affecting or not control on remote objects. Telemetry involves the transmission of measurements from the location of origin to the location of computing and consumption, especially without affecting control on the remote objects. In the context of insurance its main applications are:
 - a. Connected Cars: vehicles with devices that connect to networks (eg.: Internet) and services outside the car including other cars, home, office or infrastructure. Allow, for example, the supply of products based on vehicle use or behaviour of the driver.
 - b. Advanced Driver Assistance Systems (ADAS): systems developed to automate, adapt or enhance vehicle systems for safety and better driving. Vehicles equipped with this technology can be treated as a special category of connected cars and their presence on the streets should force insurers to adapt their pricing models.
 - c. Health monitoring: Use of devices that allow monitoring to set premiums based on vital signs (blood pressure, heart rate, respiratory rate and body temperature) and the adoption of healthy habits.
 - d. Home monitoring: Use of devices that allow the monitoring of the property situation, such as smoke detectors and carbon monoxide meters.

²³ On-Demand Economy is defined as the economic activity created by technology companies that fulfill consumer demand via the immediate provisioning of goods and services. (<http://www.businessinsider.com/the-on-demand-economy-2014-7>)

²⁴ <http://www.itu.int/ITU-T/recommendations/rec.aspx?rec=y.2060>

4. Big Data and Data Analytics: Big Data is the term used for the storage of data from different sources, in large volume and speed. The process of inspecting, cleaning, transforming, and modelling data with the goal of discovering useful information, suggesting conclusions, and supporting decision-making is called Data Analytics. In the insurance market, its application may be related to various processes, such as product offerings, risk selection, pricing, cross selling, claims prediction and fraud detection. Data from social media, for instance, can be used to offer customized products and combined with data from other sources to allow automated underwriting.
5. Comparators and Robo advisors: online services that provide automated, algorithm-based product comparison and advice without human intervention. May have more or less individualized answers according to information provided by the user. In addition to offering products, comparators and robo advisors are used for addressing concerns of right coverage through digital advice.
6. Machine Learning and Artificial Intelligence: Machine Learning is the modern science of finding patterns in your data in an automated manner using sophisticated methods and algorithms²⁵. Artificial Intelligence is “intelligence” that is not the result of human cogitation²⁶. Some authors argue that Machine Learning is a type of AI, while others argue that these terms are synonymous. They are closely linked to the technologies mentioned here and, in general, their use means leaving to base several insurance industry processes only on historical data to use data in real time and, especially, use events prediction (e.g. vehicles thefts, health problems and weather events). There is a vast scope for AI, not only in a better pricing of risks, but also in fraud prevention, claims handling or in preventive counselling.
7. Distributed Ledger Technology (DLT): A distributed ledger is essentially an asset database that can be shared across a network of multiple sites, geographies or institutions. All participants within a network can have their own identical copy of the ledger. Any changes to the ledger are reflected in all copies in minutes, or in some cases, seconds. The security and accuracy of the assets stored in the ledger are maintained cryptographically through the use of ‘keys’ and signatures to control who can do what within the shared ledger. Entries can also be updated by one, some or all of the participants, according to rules agreed by the network²⁷.
 - a. Blockchain: is a type of decentralised distributed ledger, comprised of unchangeable, digitally recorded data in packages called “blocks”. These digitally recorded “blocks” of data are stored in a linear chain. Each block in the chain contains data and is cryptographically hashed²⁸. Each block is then ‘chained’ to the next block, using a cryptographic signature. This allows blockchains to be used like a ledger, which can be shared and corroborated by anyone with the appropriate permissions.

There are many ways to corroborate the accuracy of a ledger, but they are broadly known as consensus (the term ‘mining’ is used for a variant of this process in the cryptocurrency Bitcoin). If participants in that process are preselected, the ledger is permissioned. If the process is open to everyone, the ledger is unpermissioned.

²⁵ <http://www.skytree.net/2015/08/06/driving-profitability-and-lowering-costs-in-the-insurance-industry-using-machine-learning-on-hadoop/>

²⁶ <https://www.pwc.com/us/en/insurance/publications/assets/pwc-top-issues-artificial-intelligence.pdf>

²⁷ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/492972/gs-16-1-distributed-ledger-technology.pdf

²⁸ <http://www.blockchaintechnologies.com/blockchain-definition>

- b. Smart Contracts: The novelty of DLT is that it is more than just a database — it can also set rules about a transaction (business logic) that are tied to the transaction itself. Smart contract is a term used to describe a contract whose terms are recorded in a computer language instead of legal language. Smart contracts can be automatically executed by a computing system, such as a suitable distributed ledger system. The potential benefits of smart contracts include low contracting, enforcement, and compliance costs; consequently it becomes economically viable to form contracts over numerous low-value transactions²⁹. It could also help customers and insurers to manage claims in a transparent, responsible and irrefutable manner as contracts and claims could be recorded onto a blockchain and validated by the network, triggering payments automatically when certain conditions are met.

8. Peer to peer, usage based and on demand insurance

- a. Peer-to-peer Insurance: business model that allows insureds to pool their capital, self-organize and self-administer their own insurance. The core idea of P2P is that “a set of like-minded people with mutual interests group their insurance policies together introducing a sense of control, trust, and transparency while at the same time reducing costs”³⁰.

Although it is not an innovative concept, P2P insurance is already being offered using standard technology, blockchain makes it even more transparent and trustworthy for consumers as no central authority controls its operation. For the provider, it is a tool to widely automate P2P insurance operations³¹.

- b. Usage based insurance: is a new business model introduced by auto insurers that more closely aligns driving behaviors with premium rates for auto insurance. Mileage and driving behaviors are tracked using Telematics with which the driver's behavior is monitored directly while the person drives. The insurance company then assesses the data and charges insurance premiums accordingly³².
- c. On demand insurance: new business model that specializes in covering only those risks faced at a certain moment. A number of companies is already successful in applying these ideas to the insurance market. Sure developed a mobile app to quickly close flight insurance to cover risks from take-off to landing. Mobile insurance company Trov developed a way to insure the objects that need to be insured, in a specific circumstance. Cuvva enables to insure a car exactly from the moment it starts driving till it reached its destination. Slice offers insurance policies for hosts using homeshare platforms like Airbnb, HomeAway, OneFineStay and FlipKey

²⁹ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/492972/gs-16-1-distributed-ledger-technology.pdf

³⁰ NAIC, definition of P2P insurance available at http://www.naic.org/cipr_topics/topic_p2p_insurance.htm

³¹ <http://www.mckinsey.com/industries/financial-services/our-insights/blockchain-in-insurance-opportunity-or-threat>

³² NAIC, definition of usage based insurance available at http://www.naic.org/cipr_topics/topic_usage_based_insurance.htm

Annex 2 Description and examples of InsurTech activities in all areas of the value chain.

a) Product development

1. Many new entrants are fundamentally shifting the traditional operating model with new structures and ideas, often enabled by technology, developing differentiated products and services to address customer segment needs. This most often takes the form of new types of policies and covers, like pet insurance or highly differentiated pricing for low-income customers.
2. Start-ups in this area are innovating through new business models such as Peer to Peer insurance (which redefines insurance structure by leveraging digital networks and promising transparency through models of pooling consumers together to share risk and premiums) and on-demand coverage (start-ups that are unbundling policy times and coverage and bringing new mobile-first purchasing experiences to insurance).
3. In this value chain area, innovation is focused on meeting changing customer needs with new offerings:
 - Reaching the Un(der)insured;
 - Spread of value propositions for microsegments;
 - Leveraging peer to peer networks;
 - Emerging solutions for shared economies (innovative/specialty insurance):
 - Usage & Behaviour based personalized insurance (on demand insurance or scenario based insurance: consists of small, situational insurance protection offered for high-frequency, location-based or internet transactions, including online travel and various online-to-offline (O2O) services)
 - New models of holistic advise (Robo-Advice).

Some examples:



Source: Financial Technology Partners, Infographic of the InsurTech Universe Landscape, Sept. 2016



Source: Financial Technology Partners, Infographic of the InsurTech Universe Landscape, Sept. 2016

b) Sales & Marketing

4. New entrants are developing software and providing solutions for agents and insurers to help them become more connected to their customers through better online marketing and digital customer relationship tools.

Some examples:



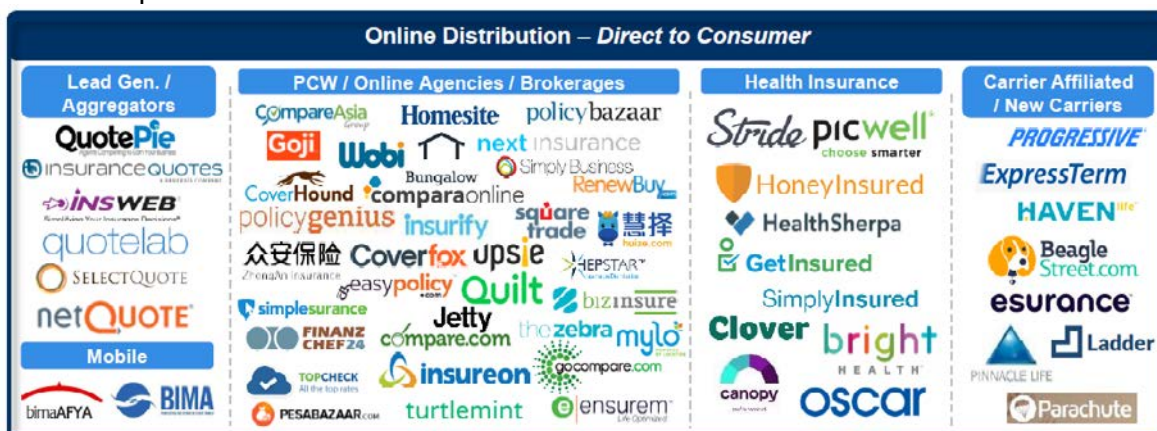
Source: Financial Technology Partners, Infographic of the InsurTech Universe Landscape, Sept. 2016

c) Distribution

5. One way that start-ups are taking advantage of this segment is by exploiting the traditionally poor interaction in a customer's life-cycle—everything from highly engaging online acquisition sources to more customer focused claims management experiences that improve user perception and loyalty. Start-ups in this area are taking a customer-focused approach and designing the interaction between insurer and policy holder to be pleasing, frictionless and even enjoyable, the customer's appreciation and perceived value are much higher, locking in loyalty and brand equity. While insurance agents are still the main distribution channel for insurance products, the online distribution models are disrupting this area, taking advantage of the increasing consumer's trend to purchase insurance online.
6. In this value chain area, innovation is focused on enhancing interactions and build trusted relationships:
 - Online channel experience
 - Online aggregation and comparison sites
 - Targeted engagement & Retention models
 - Consolidation of Self directed services

- Education & Shared Knowledge

Some examples:

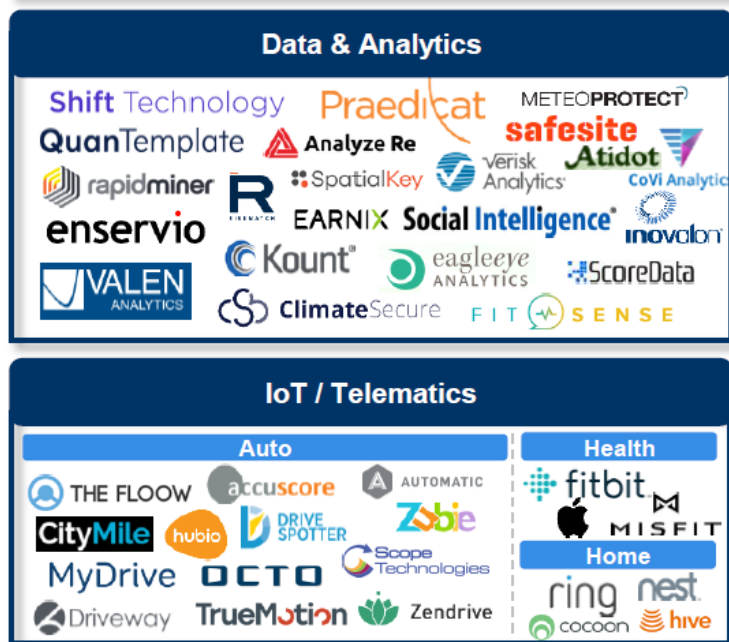


Source: Financial Technology Partners, Infographic of the InsurTech Universe Landscape, Sept. 2016

d) Pricing & underwriting: data collection and analytics

- In a time of exponential data collection, the ability to analyse that data becomes equally as valuable as collection itself. For insurers, there is an abundance of personal data that can lead to valuable insights into the minds and lives of customers that translate into very real business intelligence and a distinct competitive advantage.
- Start-ups are looking to exploit this sector in a couple of ways. On the one hand, the collection of data, technology like the Internet of Things (IoT), and internet-connected wearables is allowing to capture more data than ever imagined. Sensor technologies in the car, the home and on the body promise to lay the foundation for tailored insurance plans and a claims model built around prevention rather than reaction (connected coverage). On the other hand, many start-ups are flexing their analytical prowess by developing solutions to process the vast data available and turn it into actionable insight.
- In this value chain area, innovation is focused on:
 - Leveraging existing data and analytics to generate deep risk insights:
 - Connected car and automated driving systems
 - Connected Health & P4 Medicine
 - Remote data capture and analysis
 - Quantification of emerging risks
 - Utilizing new approached to underwrite risk and predict loss:
 - Sophistication of preventative insurance models
 - Shift from probabilistic to deterministic model
 - Granular Risk and/or Loss Quantification
 - Pay-when-you-need service

Some examples:



Source: Financial Technology Partners, Infographic of the InsurTech Universe Landscape, Sept. 2016

e) Claims management

10. Start-ups in this area are developing digital tools aimed at making claims management processes easier for consumers, brokers and adjusters. Innovators are exploring how drones can transform the claims processes, and are developing applications of distributed ledger technology for claims management and for preventing insurance fraud.

Some examples:



Source: Financial Technology Partners, Infographic of the InsurTech Universe Landscape, Sept. 2016

f) Support functions

11. In the majority of businesses, optimization equals automation — using technology to replace administration tasks and decrease the need for human oversight and interaction.

12. Where many insurance companies have not introduced process improvement and digitization, many start-ups are stepping up to help improve these functions, both for customers and for employees.

13. Some new entrants are focusing on the development of digital tools for consumers to better manage their policies and administration software for insurers to automate various policy management processes, while others are concentrating in solutions or tools for employee benefits administration, benefits shopping, as well as private insurance exchange technology and platforms for carriers and employers.

Some examples:



Source: Financial Technology Partners, Infographic of the InsurTech Universe Landscape, Sept. 2016