

The Impact of digital Technologies on Insurance Industry
in light of digital transformation

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بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ

وَمَا أُوتِیْتُمْ مِّنَ الْعِلْمِ إِلَّا قَلِیْلًا

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ABSTRACT

This paper is concerned with the impact digital technologies have on insurance, and reflects on the contribution that insurance makes to the development of a digitalized economy. Technology and new data sources are changing fundamentally our economy and society, and promise to transform the insurance industry as well. New technology startup firms—or Insur_Techsⁱ—are entering the industry to deliver some of the services typically provided by incumbent insurers and intermediaries. Industrial companies as well as established technology firms are eyeing opportunities in insurance. The new entrants present opportunities for mutually beneficial partnerships with insurers but they could also become direct competitors, putting pressure on profit margins and challenging the insurers, especially at their interface with customers.

Digitalization is widening the role of insurers from one primarily concerned with loss indemnification to a broader advisory service for insured's on how to prevent, mitigate and manage risks. That is to say, new technologies allow insurance to evolve from pure risk protection towards risk prediction and prevention. Underwriting, pricing, claims handling—all these processes could become more efficient thanks to digital technologies. But digital technologies also give rise to new challenges. For example, technology driven personalized pricing could also mean that for some individuals who are exposed to a higher risk within any given risk pool, adequate insurance cover might come at too high a price. Societies need to reflect on this and on the risk that ethics and data protection may lag behind technological progress.

Insurance plays an important role in helping to address some of societies' greatest challenges. In the face of the ever increasing digitalization of the economy, and in spite of pervasive trends to personalize more and more aspects of our daily lives, risk pooling through insurance is likely to remain as the best response of the industry to the financial consequences of risk.

Motivation and aim of the paper

While digitalization—the integration of the analogue and digital worlds with new technologies—has already substantially transformed many other industries,¹ industry commentators believe that the transformation of the insurance industry in general and the Arab insurance industry in particular has come rather late² and that it has yet to exploit the full potential of digital technologies.³ Still, most market participants believe that digitalization will fundamentally change the value creation of this industry, with manifold new ways of customer interaction, new business processes, new risks, and new products.⁴ Moreover, recent advances in insurTechⁱ have triggered an immense interest among practitioners worldwide. Given this transformation and the magnitude of interest, it seems astonishing that up to now the academic discussion on digitalization has been virtually non-existent.

This paper is a comprehensive review of the impact of digitalization on the insurance industry. It establishes a database of studies, articles and working papers, and systematically evaluates the impact of digitalization. In the light of the most important modern digital trends that affect the insurance industry in general and the Arab insurance industry in particular and Berliner's⁵ insurability criteria. Based on the review results, we derive potential future work from the perspectives of industry and research. We do this to provide insurance practitioners and academics with a high-level overview

¹ See, for example, Moreau (2013) on the music industry or Chathoth (2007) on the travel industry; we also refer to Back et al. (2016) and Kane et al. (2015) for cross-industry comparisons on the importance of digitalization.

² Müller et al. (2015).

³ Catlin et al. (2015).

⁴ Dozens of media articles and studies analyse the impact of new technologies on customer satisfaction and loyalty (e.g. Maas and Bühler, 2015; Moneta, 2014), on the improvement of cost structure and business processes (e.g. Berger et al., 2016; Catlin et al., 2015; Chester et al., 2016), on the future workforce (e.g. Johansson and Vogelgesang, 2015), and on the insurability of new risks (e.g. Biener et al., 2015, for cyber risk). These industry studies focus on specific digitalization trends and their strategic implications; none of them offer an overview of the existing knowledge on digitalization.

⁵ Berliner (1982).

of the main research topics and to encourage future academic work in this field. The focus of the analysis is on the business and economics literature in the risk and insurance domain. To structure our discussion, I organize the paper into six chapters and four core topics (see Figure 1). The first step is introduction and to analyze the main technologies which influence the insurance sector

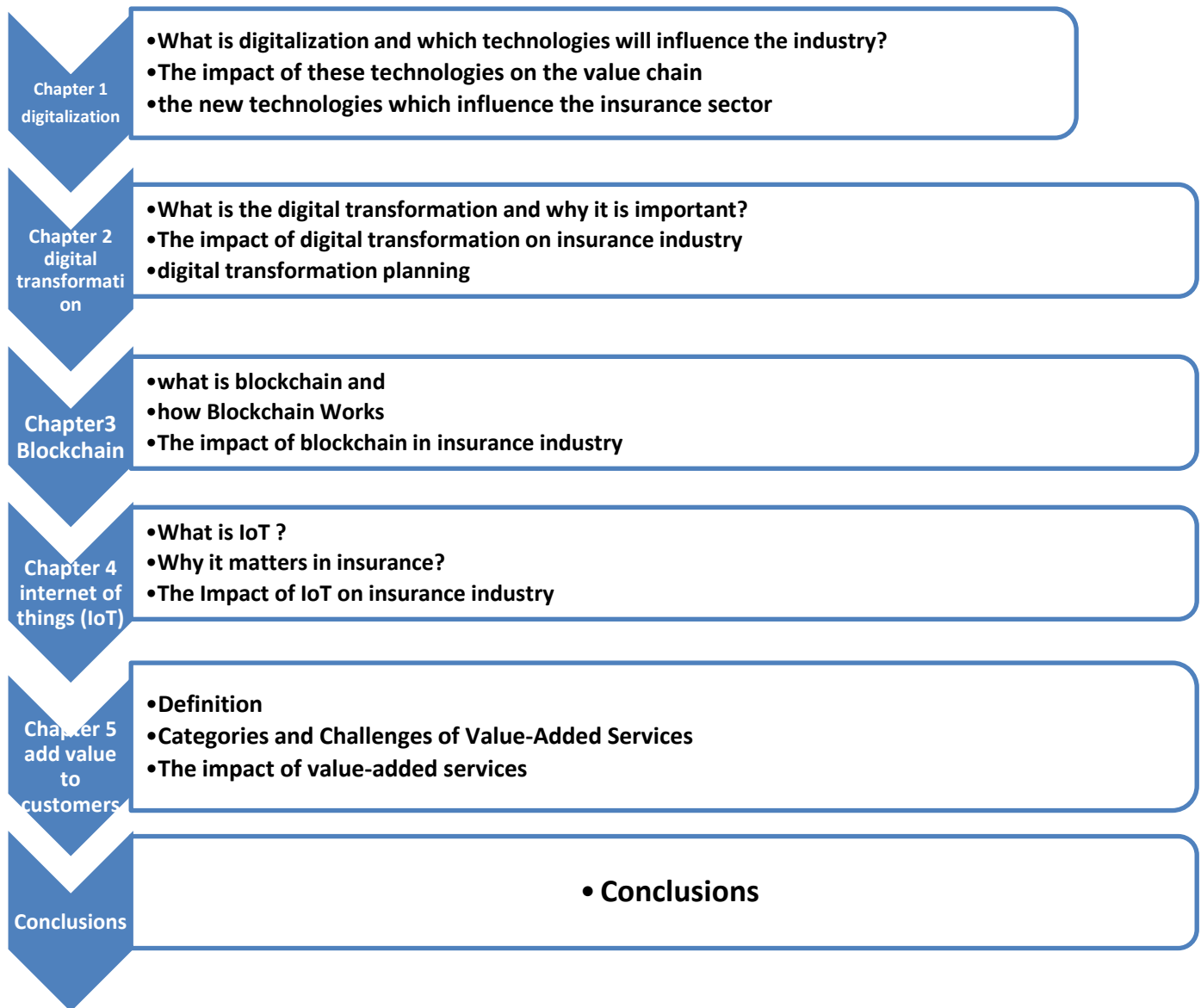


Figure 1

Based on the results, we describe the impact of those technologies on the insurers' value chain and insurance industry derive the consequences for applying this technologies to

insurability of risks; here we also discuss whether insurance companies will lose substantial parts of their business to other industries or to insurTech companies.

The remainder of this paper is structured as follows:

1. Chapter 1# digitalization

- What is digitalization and which technologies will influence the industry?
- the impact of these technologies on the value chain
- the new technologies which influence the insurance sector

2. Chapter 2# digital transformation

- What is the digital transformation and why it is important?
- The impact of digital transformation on insurance industry
- digital transformation planning

3. Chapter 3# Blockchain

- what is blockchain ?
- How Blockchain Works
- The impact of blockchain in insurance industry

4. Chapter 4# internet of things (IoT)

- What is IoT ?
- Why it matters in insurance?
- The Impact of IoT on insurance industry

5. Chapter 5# add value to customers

- Definition
- Categories and Challenges of Value-Added Services
- The impact of value-added services

- Finally, we discuss the Conclusions from practitioners' and researchers' perspectives (“Derivation of potential future work”).

Keywords: digital insurance, digital transformation, internet of things (IoT), add value to customers, Blockchain, top trends, Arabic insurance industry, Impact and Implications of Digitization

Chapter1

Digitalization

Introduction

Just as the Industrial revolution did one and half centuries ago, even now the digital revolution is reshaping the way we live our lives and the way we work at our work places. It is also forcing a fundamental transformation of business – changing the relationship with customers, bringing new entrants and their disruptive technologies, driving new channels, products and services, breaking down the walls between industries and, in many cases, forcing a basic rethink of the business model. The speed of change makes it almost impossible to predict the future with any degree of certainty. In such a climate, insurance company have to act fast It must enter the digital world as quickly as possible and use digital technology with all its benefits so that it can genie the benefits of this technology, digital technology has the potential to reshape the insurance industry as it has already reshaped many industries, such as mobile banking, e-books, and other innovations related to digital technology, such as financial services, travel, printing and publishing. Despite expectations that large and lucrative insurance companies may turn to the technology in their day-to-day operations, we do not see any decisive decisions or even indications of this trend, especially in the arab insurance industry, due to a widespread illiteracy in the field of insurance awareness or a decline in the degree of insurance culture in the Arab countries, or because of the scarcity of insurance expertise or the absence of marketing capacity for insurance products, the almost complete absence in the application of digital technology in insurance transactions is one of the most important obstacles in the way Insurance sector update. If Western insurance experts assert that the most important benefits of digital technology meet the needs of customers and reduce public or administrative expenses, which all insurance companies work for at least profitability, we do not see on the horizon

indicates the attempt to prepare local competencies technically and professionally to apply This technology, all indicators point to the existence of huge opportunities in the field of information technology that has not yet been exploited by the global and Arab insurance companies, although the full mechanization of the insurance companies will take a compulsory path in the next stage, especially with the decline of manual handling of information and data and increasing technological dealings through the existence of a website for each Insurance company, and display its products on it mainly in the future. In addition, digital marketing is able to issue easy and simple insurance documents, which is indicative of the lack of human intervention in the insurance process in the coming stages.

1/1 What is digitalization and which technologies will influence the industry?

In a first step, we scan through most articles and studies for different definitions of “digitalization” and compare them⁶.

describe digitalization⁷: way and in technical terms such as the availability of digital data: every detail of life is stored in interconnected databases, resulting in a real-time exchange of information.

focus on the business consequences digitalization is: the use of new technologies to industrialize and atomize processes, to change the communication between customer and insurer, and to generate and evaluate new data.

Mu“ller et al², Hiendlmeier and Hertting⁸, describe digitalization as a combination of different components. Whereas Hiendlmeier and Hertting determine analytics, processes, business impact, technology, mobility and data as the four components of

⁶ The terms “digitization” and “digitalization” are sometimes used synonymously and sometimes not. “Digitization” is often defined in the technical context of making analogue data digitally available (e.g. Ingleton et al., 2011; Breeding, 2012)—for example, scanning of paper contracts. In contrast, “digitalization” is a broader description of the transformation of the economy and society.

⁷ Tischhauser et al. (2016).

⁸ Hiendlmeier and Hertting (2015)

digitalization also consider a digital customer experience and customer centricity in their definition

Back et al⁹. Offer the broadest definition, comprising strategic and cultural elements: the digital transformation is characterized by the changes in corporate strategy, business model, processes and corporate culture caused by technologies with the aim of enhancing competitiveness.

I choose a middle way between the broad and narrow definitions and define digitalization for the purpose of this paper as “the integration of the analogue and digital worlds with new technologies that enhance customer interaction, data availability and business processes.” This definition and the discussions in this paper focus on digital transformation and the important tools used in the process of digital transformation and its impact on the insurance industry so easy to say that we are actually using digitization in the operating models, also there is a lot of trends which is very important too for insurance industry like using the use of artificial intelligence and big data in the insurance industry but this is beyond the scope of this paper, In Table 1, we list all technologies which are discussed in the reviewed studies, ¹⁰define them, and explain the extent of their implementation in the insurance industry ,I n the table, we can identify three broad categories of change in the insurance industry:

1- New technologies change the way insurers and customers interact (e.g. social media, chatbots and robo-advisor).

2- New technologies can be used to automatize, standardize and improve the effectiveness and efficiency of business processes (e.g. online sales, digital claims settlement).

⁹ Back et al. (2016).

¹⁰ **19 We do not discuss virtual reality which has been mentioned by some studies but whose applications to insurance have not yet been developed.**

3- New technologies create opportunities to modify existing products (e.g. telematics insurance) and to develop new ones (e.g. cyber insurance).

Panel A: Technology for data acquisition and analysis		
Technology	Explanation	Status quo in the insurance industry
Digital transformation	Digital transformation is a term used so frequently and variously that it is commonly misunderstood. The term is best defined as capitalizing on the power of technology to revisit business models, acquire customers to new channels and create essential user experiences.	New competitive threats, ongoing cost pressures, aging technology, increasing regulatory requirements and generally lackluster financial performance are among the forces that demand significant change and entirely new business models
Artificial intelligence	<ul style="list-style-type: none"> • Science and engineering of making intelligent machines • AI covers the process of analyzing (big) data (e.g. with machine learning methods) and automated decision making based on that data 	<p>Japanese insurer Fukoku Mutual Life uses IBM’s Watson Explorer for automated payout calculation (still subject to human approval)</p> <ul style="list-style-type: none"> • By analyzing a picture of the insured, Lapetus can estimate the relevant data for a term life policy. The conclusion of the contract can be processed much faster
Big data	Large (partly unstructured) data,	Also, AI is used in chat bot

Panel A: Technology for data acquisition and analysis		
Technology	Explanation	Status quo in the insurance industry
	<p>which are, for example, generated by telematics devices, social networks, or other internet sources</p> <ul style="list-style-type: none"> • Different data types (e.g. text, audio, video) from many data sources 	<p>applications Many insurers use text mining, e.g. for fraud detection or analysis of web content for customer acquisition</p> <p>26 per cent of German insurers are using big data analytics and 46 per cent have developed a big data strategy</p>
Internet of things	<p>Connected world; every element sends and receives information through sensors</p> <ul style="list-style-type: none"> • Sub-topics: telematics devices, smart home, smart factory 	<p>Telematics devices are starting to be more integrated in health insurance (e.g. vitality program from General) and motor insurance (e.g. Progressive, State Farm)</p>
Blockchain	<p>Decentralized database of all digital transactions among participants</p> <ul style="list-style-type: none"> • Contracts could be stored and automatically executed (smart contracts) 	<p>Aegon, Allianz, Munich Re, Swiss Re and Zurich have founded the blockchain Insurance Industry Initiative B3i to analyze the potential</p> <ul style="list-style-type: none"> • Allianz and Nephila piloted the blockchain technology for cat swap transactions • Fizzy by AXA has developed a peer-to peer flight insurance

Panel A: Technology for data acquisition and analysis		
Technology	Explanation	Status quo in the insurance industry
		based on blockchain technology which pays automatically without any claim filing if a flight is delayed by more than two hours
Panel B: Technology for communication and sales		
Technology	Explanation	Status quo in the insurance industry
Mobile devices with apps	Smartphones/tablets with their applications replace desktop computers <ul style="list-style-type: none"> • People are always online as a result of mobile internet access 	Apps are used for claims reporting (e.g. Allianz, Debeka) and sometimes for contract administration and customer service (e.g. Allstate) <ul style="list-style-type: none"> • Insurtech Trov and Lemonade use solely an app for their insurance products • Apps can be used for a more efficient sales process. Agents and brokers can be supported by a variety of tools (e.g. electronic signature, task and time management)

Panel A: Technology for data acquisition and analysis		
Technology	Explanation	Status quo in the insurance industry
Social network (Facebook)/messenger (WhatsApp)/internet forum	<ul style="list-style-type: none"> • Platforms for private persons and organizations to share information (statements, pictures, videos) • Messenger services have replaced text messages and are starting to get more attention than social networks • Internet forums provide an easy way to get help for frequently asked topics 	<p>Facebook is often used by insurance companies</p> <ul style="list-style-type: none"> • Some have also started to use messenger services, e.g. Ergo uses WhatsApp for customer service • Forums are used to screen feedback of customer, to intervene in case of queries, and to communicate actively with (potential) customers
Website	<ul style="list-style-type: none"> • Insurers present various information on the company, the products, etc. • Insurers offer policies via websites 	<p>Used by all insurance companies in the life and non-life segment</p> <ul style="list-style-type: none"> • Also, new players that focus on online sales only (e.g. Cosmos Direct, smile. direct) • First contact either via own websites or aggregators (e.g. Check 24, Compares)

Table 1

1/2 The impact of these technologies on the value chain

Table 2 analyses the potential impact of the new technologies (see Table 1) on the value chain of insurance companies Referring to the two principal categories of change

discussed in the section “What is digitalization and which technologies will influence the industry?”

The first obvious impact on the value chain is the way insurance companies interact with their customers (e.g. sales, customer service) and how they adapt to their behaviors¹¹ Whereas customers traditionally needed personal interaction (agent, broker, bank, etc.) for product information, today they get most information online and directly compare products and prices via aggregator platforms. Some products can be purchased online without any personal interaction. Also in later stages of the value chain, digital technologies such as apps offer assistance and support claim reporting.

The second obvious change concerns the digitalization of all processes along the value chain, leading to the automatisisation of business processes (e.g. automated processing of contracts, automated reporting of claims) and decisions (e.g. automated underwriting, claim settlement, product offerings). While transaction-intensive industries like health insurance are already widely using background processing¹², the use of Blockchain will trigger a further automatisisation wave in the insurance industry.

Table 2 Impact of digitalization on the insurer’s value chain

¹¹ Bieck and Tjioe (2015) find that people under the age of 30 are more open to non-traditional insurance providers (e.g. auto dealers, retailers). Bieck et al. (2014) find that future customers will be less price sensitive, will seek advice, want personal multi-channel interaction, and be open to new products. Concentrating on the motor insurance segment, Barwitz et al. (2016) define four customer segments based on the interaction between customers and insurers, independent of socio-demographics: utilitarian’s change the interaction frequently, depending on their personal benefit; hedonists prefer a high-quality and personal interaction; cost-minimizers want to reduce money and time investments; rationalists prefer personal interaction and stay loyal to their agent. Catlin et al. (2013) define nine customer segments, depending on the preferences for price, brand, loyalty, convenience and personal advice

¹² association of British insurers (2016) find that today on average 41 per cent of processes are automated in the England, and Austrian insurance industry, and health insurers have already automatized 47 per cent of processes; they estimate automatisisation will increase by 28 per cent, leading to an average cost saving of 14 per cent. Swiss Financial Market Supervisory Authority FINMA (2015) note in their global study that 70 per cent of processes today are done mostly manually, 25 per cent are partially automated, and only 5 per cent are fully automated; through digitization, only 15 per cent of processes will be still be done mostly manually whereas 50 per cent will be semi-automated and 35 per cent fully automated; it is possible to save 30 to 50 per cent in non-commission costs through automatisisation. Note that neither of the studies mention a time period for reaching full potential.

Value chain process	Tasks	Impact on the value chain
Marketing	<ul style="list-style-type: none"> • Market and customer research: researching ideas for product development • Analyzing target groups • Development of pricing strategy for product sales • Designing of advertisement and communication strategies 	<p>Big data:</p> <ul style="list-style-type: none"> • More data resources for better customer segmentation • Better calculation of the customer lifetime value and cross-selling potential <p>Video platforms:</p> <ul style="list-style-type: none"> • Use of videos for product explanations to (future) customer, company news, topics of asset management, regulations, etc. <p>Website, social networks, and messenger:</p> <ul style="list-style-type: none"> • Product information/advertisement, reputation management
Product development	<ul style="list-style-type: none"> • “Manufacturing” the products • Product pricing (actuarial methods) • Check legal requirements 	<p>Blockchain:</p> <ul style="list-style-type: none"> • Smart contracts, e.g. Fizzy by AXA • More and better data allow the insurer to reorganize the risk pools and apply more risk-appropriate pricing <p>Internet of things:</p> <ul style="list-style-type: none"> • New products focusing on prevention or situational insurance, e.g. travel insurance at hotel check-in <p>Internet of things:</p> <ul style="list-style-type: none"> • New products focusing on prevention or situational insurance, e.g. travel insurance at hotel check-in

Value chain process	Tasks	Impact on the value chain
Sales	<ul style="list-style-type: none"> • Customer acquisition, consultation • Product sale • After-sales 	<p>Blockchain:</p> <ul style="list-style-type: none"> • The CRM system can automatically be enriched with data from other data sources such as websites, etc. <p>Cloud computing:</p> <ul style="list-style-type: none"> • Contract information stored digitally <p>artificial intelligence:</p> <ul style="list-style-type: none"> • Product sale can be automatically conducted via chatbot; for the customer, it is the same experience as chatting with a real human <p>Social networks and messenger (add Value):</p> <ul style="list-style-type: none"> • New acquisition channels: messenger, social media Video calls and mobile devices: • Sales location-independent through use of tablet, video calls, etc. <p>Website and apps:</p> <ul style="list-style-type: none"> • New information and sales channels, partly/fully automated • Some process steps done by the customer (e.g. data input)

Value chain process	Tasks	Impact on the value chain
Underwriting	<ul style="list-style-type: none"> • Application handling • Risk assessment • Assessment of the final contract details, if necessary ask for more information 	<p>Artificial intelligence:</p> <ul style="list-style-type: none"> • New possibilities for risk assessment, e.g. through image or language processing <p>Blockchain:</p> <ul style="list-style-type: none"> • All information stored for automated underwriting <p>Cloud computing:</p> <ul style="list-style-type: none"> • Contract information stored digitally • More data for risk assessment (reduction of information asymmetry, ex post and ex ante) <p>Internet of things:</p> <ul style="list-style-type: none"> • Telematics devices are used to get customers' data for risk and pricing calculation
Claims management	<ul style="list-style-type: none"> • Investigation of fraud • Claim settlement 	<p>Artificial intelligence add value :</p> <ul style="list-style-type: none"> • Prevention of fraud through data analytics • Automated calculation and payout of the amount of damage <p>Blockchain:</p> <ul style="list-style-type: none"> • Storage of the information for the automated payout • Mobile devices with apps: • Customers file their claims via smartphone
Asset management	<ul style="list-style-type: none"> • Asset allocation • Asset liability management 	<p>Blockchain:</p> <ul style="list-style-type: none"> • As a result of using one central database, transaction costs could decrease

Value chain process	Tasks	Impact on the value chain
Risk management	<ul style="list-style-type: none"> • Analysis and management of all risks 	<p>Artificial intelligence and big data:</p> <ul style="list-style-type: none"> • Automated decision-making, e.g. for risk transfer or automated reporting
IT	<ul style="list-style-type: none"> • IT procurement (hard-/software) and installation • IT service • IT support • IT development • Coordination of IT processes 	<p>Internet of things:</p> <ul style="list-style-type: none"> • IT systems automatically report trouble and provide support to fix the problem <p>IT development:</p> <ul style="list-style-type: none"> • Processes have to be more flexible and the “time to market” has to be shorter
Controlling	<ul style="list-style-type: none"> • Data capture and analysis • Reporting • Business-KPI measurement 	<p>Blockchain:</p> <ul style="list-style-type: none"> • Digitized data makes it easy to generate automated reports • Technology will enable interactive reporting (selection of reporting data), dynamic reporting and real-time planning
Public relations	<ul style="list-style-type: none"> • Press/investor management 	<ul style="list-style-type: none"> • Shift from offline to online • New communication channels: social media, messenger, etc

- First, insurance companies need a workforce and tools to analyze large, often unstructured datasets which are generated by telematics devices, social networks, or other internet sources (e.g. customer feedback, pictures, videos)

- Second, the use of big data raises legal and ethical questions. Politicians are now discussing whether insurers should be allowed to use all of the generated data for decision making, how long they may store the data, and which actions insurers must take to protect the data (e.g. against cybercrime¹³).
- A third obvious impact is that digitalization changes existing products (e.g. telematics insurance) and allows new product offerings (e.g. cyber risk insurance). Telematics devices are used in life/health and motor insurance to build smaller and more accurate risk pools and offer cheaper prices to good risks.

The technological progress to date also makes it possible to underwrite risk which could not have been insured up to now¹⁴. Furthermore, smart contracts—i.e. programs that automatically execute the claim payment under pre-defined conditions stored in the blockchain—have the potential to be fully digital and fully automatic products.

1/3 The new technologies which influence the insurance sector

As we can see from table 1,2 we can say Insurers' operating and business models are evolving, driven by trends such as a disaggregation of the insurance value chain, new product opportunities emerging from the sharing economy, and the trend of insurers providing value-added services as a means to differentiate their companies in a competitive market. Also digital tools that are creating greater market transparency and competition, and growth of direct channels in the small business market. The stream of new technologies finding applications in the insurance industry is also increasing every day. Blockchain, internet of things (IoT), Process Automation (RPA) are some of the

¹³ For example, the EU has reformed its data protection rules to simplify the use of big data for businesses and to set high standards of data protection (European Commission Justice, 2016). Furthermore, see Krotoszynski (2015) for a detailed comparison between the U.S. and EU legal systems regarding privacy rights.

¹⁴ One example is the use of Blockchain techniques for risk underwriting and analysis; Climate Corporation (US) uses climate and soil data to offer farmers insurance against losses from weather events (Mu"ller et al., 2015). AllLife (South Africa) offers life and disability insurance to policyholders, who suffer from HIV or diabetes; in their monthly health checks, every client gets a personalized analysis and advice on managing their conditions. To assess their clients' conditions the insurer has direct access to medical data from medical providers. If clients do not follow the check-up plan, coverage can be reduced or cancelled, Egypt is in the process of applying the same technology in the field of health insurance with a very fast steps

key areas that have significant potential to streamline insurers' operations while enhancing customer experience. Likewise, augmented reality is being explored for applications beyond marketing in insurance. The digital economy will make usage-based, on-demand and 'all-in-one' insurance lifestyle products more relevant. Customers will prefer personalized insurance covers instead of the one-size-fits-all products currently available. Flexible coverage options, micro insurance and peer-to-peer insurance will become viable options in the long run. Reinsurers will provide risk capital directly to digital brands, and regulatory frameworks will accommodate shorter value chains. InsurTech firms have been showing significant growth in the areas of auto, home ownership and cyber insurance. Such strong growth will stimulate traditional insurers to either acquire technology capabilities or partner with InsurTech companies. With an increasing demand for innovative products and services from millennials, such collaboration will become a critical imperative¹⁵.

¹⁵ THE INSURTECH REPORT: How financial technology firms are helping - and disrupting - the nearly \$5 trillion insurance industry

Chapter 2

Digital Transformation

The insurance industry is driven as a commodity rather than a service¹⁶. Providing a low price is critical, optimizing risk assessment is an obsession and processing customer efficiently is a key focus¹⁷. As a consequence the digital transformation unlike in other industry remains a low priority¹⁸. Meanwhile with the insurance customer of the digital and the all online, wants not only to access anything, everywhere at any time, but also reaches everything anywhere every time. The customer wishes to acquire customized products & personalized services promoted through mobile, tablet or computer. The Digital world, is new for consumerists, opens a new era where every business must learn how to cope in order not to disappear. It includes the insuranceⁱⁱ¹⁹. Yet, to embark into the digital journey an industry that is heavily regulated and historically formatted – like the insurance - is not an easy task. Stringent compliance, complex legal requirement and systematic governance do not help innovation. Digital requires redefining the traditional methods and open doors to reinvent itself.

Therefore, insurers must move boldly to devise enterprise-scale digital strategies (even if they are composed of many linked functional processes and applications) and “industrialize” their digital capabilities — that is, deploy them at scale across the business. This paper will identify an actionable definition of digital transformation and explore a range of specific use cases that can produce the breakthrough performance gains and ROI insurers need.

¹⁶ Gumm, D. (2014). Insurance: Service or commodity?. *Professional Beauty*, (Sep/Oct 2014), 154.

¹⁷ Miller, D. (2011). *Breaking with Tradition in the Insurance Industry: Strategies to Insure Operational Efficiency and Future Growth*

¹⁸ Brozek, M. (2015). *Insurers still have a long road to go in digital transformation*. Accenture Technologies – Forrester Research

¹⁹ Nicoletti, B. (2016). *Digital Insurance: Business Innovation in the Post-Crisis Era*. Springer.

2/1 What is digital transformation?

Digital transformation is a long and continuous journey; most insurers are best served by a phased or progressive approach. This is not to suggest that culturally risk-averse insurers adopt even more caution. Rather, it is to acknowledge that complete digital transformations at one go can't be managed; there are simply too many contingencies, interdependencies and risks that must be accounted for. Insurers must be focused and bold within their progressive approach to digital transformation, as it is the way to generate quick wins and create near-term value that can be invested in the next steps. Each step along the digital maturity curve enables future gains. Rather than waiting to be passively disrupted, truly digital insurers move boldly and proactively, testing and learning in pursuit of innovation, and redesigning operations, engaging customers in new ways and seeking out new partners.

Digital transformation is a term used so frequently and variously that it is commonly misunderstood. The term is best defined as capitalizing on the power of technology to revisit business models, acquire customers to new channels and create essential user experiences.

Of course, there are many other definitions of digital transformation, but here we look at it from the perspective of the business context, it also impacts other organizations such as governments, public sector agencies and organizations which are involved in tackling societal challenges such as pollution and aging populations by leveraging one or more of these existing and emerging technologies.

2/2 Why it is important for the insurance sector?

Digital transformation is important for many industries; however, for the insurance sector it's a business priority. It's not about adopting an innovative or solely external

process; digital transformation in insurance requires an innovative business model that is focused on customer needs, more connected products and services, emerging technologies and real-time data. also customers increasingly expect a near real-time relationship with the insurer for the submissions and claims and especially for customer care The importance of the digital transformation of the insurance industry can be summarized below:

1- **Minimizing paper documents:**

In digital transformation, insurance company's reliance on electronic transactions is executed without the need to use paper in the sales of documents or the number of claims. Contracts can also be stamped with digital signatures. This called on international organizations to establish a legal framework for e-commerce and to sign and pay electronically²⁰.

2- **Narrowing the distance between companies:**

Digital transformation narrowing the distance between the giant and small companies in terms of production and distribution and human competencies; so that small companies can access the Internet to the domestic market and international also without having the infrastructure such as large multinational companies and make them stand on an equal footing with These companies are in competition. This is due to the use of the same method in the execution of purchases and sales, filing claims and providing various types of services electronically.

3- **Fighting fraud is easier with technology:**

As processes speed up in order to provide better and faster service to customers, it is logical to expect that the number of fraudsters or fraudulent claims that are not discovered by claims handling will also increase. But technology also helps in this area, often without disturbing the customer experience. The basis of this is data and

²⁰ Dorner, K. and Edelman, D. (2015) What 'Digital' Really Means, McKinsey & Company, available at <http://www.mckinsey.com/industries/high-tech/our-insights/what-digital-really-means>,

the possibility of using enormous quantities of data very quickly and with reliable results, for example for making predictive models. It is possible to make the automated claims handling process fast and friendly for honest customers. At the same time, it is possible to simplify processes, reduce risks and prevent and detect more fraud. 32% of insurers now use technology for fraud prevention. 48% of insurers use it to determine the level of premiums and 45% use it to support underwriting.

4- **Rural areas:**

Insurance companies have access to individuals in less developed areas and rural areas and provide insurance services that can't be available to them in normal ways and without having to travel away to them (direct contact).

5- **Visual screening during the claims process:**

Visual screening can be very valuable for claims handling and fraud prevention, such as the automated assessment of photos and videos of objects and damage. This makes the assessment objective and speeds up the process. It is possible to identify striking features or to make comparisons with similar objects via various sources. This can bring fraud to light. 29% of insurers now use such a technique. In the past two years, this percentage has not increased, but knowledge of the technique has. Insurers are also increasingly convinced of its value and 20% intend to start using the technique in the coming year.

6- **Gross national product:**

The increase in growth rates in the volume of premiums or investments in the insurance sector, as well as the improvement of the legislative environment of this sector leads to an increase in national output

2/3 The impact of digital transformation on insurance industry :

The most important question now will be what would be the impact of digital on the insurance industry transformation? The digital empowerment changes completely the

purchasing behavior of the customer. The insurance industry realizes that this change will also happen and it must act fast. For the past five years, the insurers have evaluated the opportunity to transform themselves. The digital era becomes an opportunity²¹. New product, new way of marketing, new data is used for underwriting pricing more accurately and professionally, makes it easier for customers to buy and track the speed at which their policies are growing, requires an innovative business model that is focused on customer needs, more connected services, emerging technologies and real-time data, helping in fight off fraudulent claims, by helping build a superior system to detect the same by using big data analytics, The following figure (2) show the impact of digital

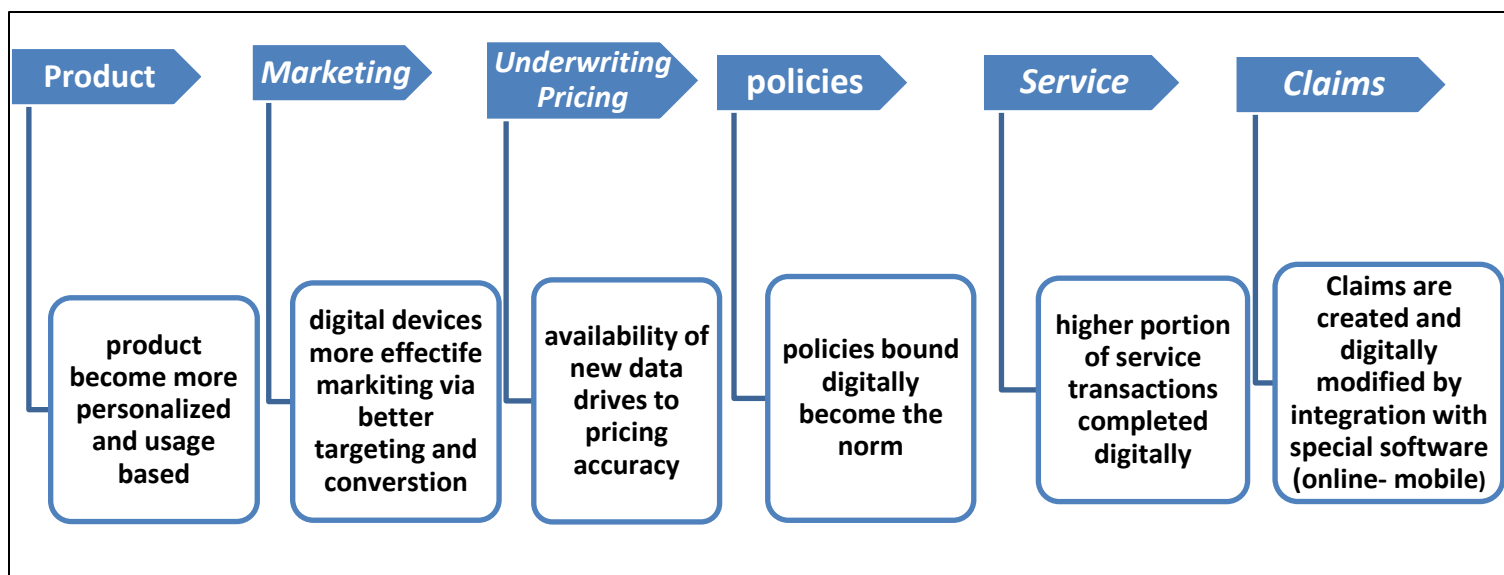


Figure 2

transformation in many level on insurance industry.

2/3/1 Product: -

As digitization becomes more prevalent, customers are changing their behavior. They use multiple channels to gain access to products, have increased affinity for self-service, and expect – or in isolated cases already receive – individually customizable products. These forms of custom-fit interaction and offers push the

²¹ Trussell, M. Reader, G. (2015). The insurance innovation imperative. A new world of opportunity, KPMG 3-9

customer increasingly into the focus of insurance companies' activities. These, in turn, must now create a better basis for rigorously and fully implementing a customercentric focus. also analytics that “listen” to customer inputs and recognize patterns can identify opportunities for new products that can be launched and deep analysis of the customer base which may make clear which distribution channels (including individual agents and brokers) are the best fit for certain types of customer leads

2/3/2 Marketing:

Evolving consumer behavior is threatening traditional growth levers such as TV advertising and necessitating a shift to personalized mobile and online channels, insurers are picking up the pace and using multiple channels to target consumers. Email, social, websites, mobile, phone, and direct mail are all popular methods for customer and prospect outreach. Although insurers are engaging through a variety of channels, the missing link is the enablement of seamless movements between each channel. As consumers use different channels at different points in the purchase process, the ability to move easily and effortlessly from channel to channel, or even from device to device, is vital for a positive experience.

2/3/3 Underwriting pricing:-

The combination of rich customer data, telematics, and enhanced computing power is opening the door to usage- and behavior-based pricing that could reduce barriers to entry for attackers that lack the loss experience formerly needed for accurate pricing, The combination of rich customer data, and enhanced computing power is opening the door to usage- and behavior-based pricing that could reduce barriers to entry for attackers that lack the loss experience formerly needed for accurate pricing. While the advent of online players certainly has been a challenge it also has proven to be a benefit for insurance companies as they seized the

opportunity to use more direct and digital channels, both for marketing and actual underwriting purposes. The fact that consumers increasingly use digital and mobile in this regard helped lower acquisition costs to some extent and in certain regions. In countries and regions with high competition and a high maturity level regarding such digital offerings and services, the impact of on the acquisition costs has been less significant and, in general, acquisition costs have continued to be a key challenge.

2/3/4 Policies:-

Customers can now literally buy insurance policies at the click of a button policies developed are fully automatic and are updated using a database, additionally, having such self-serving dashboards makes it easier for customers to decipher complicated insurance policies, calculate monthly premiums and the impact these will have on their longer term financial future and plans. Complicated policy coverage costs can now be seen virtually, helping customers understand the rates of change and thereby, determining which plans will suit them best. Digitization also makes it easier for customers to track the speed at which their policies are growing. Insurance providers are constantly looking to push the envelope with the advent to the digital age to make applications more interactive and easy to use for customers. For instance, in several countries customers can use their smartphone to upload a picture of something they would like to insure: car, bicycle, camera, or anything else and request a policy for the same. The application uses available data about your product and comes back with an immediate policy offer that you can accept within seconds.

2/3/5 Services:-

Insurance providers who go beyond the insurance product and struggle to get a superior customer experience are necessary, as consumers expect self-directed personal

interactions with companies across any device at any hour, as with online retailers such as Amazon. Hence, the benefit of the services is that the services add to the insurance company many benefits such as linking the insurer to the insurance company to identify everything that is new and special company and we will in the fourth chapter to explain the detailed services and the great utility of the insurance company unfortunately services.

2/3/6 Claims:-

A prerequisite of digitization is modern IT architecture, which for the insurance industry means faster processing, computation and storage. This has enabled insurance companies to arrange and document claims on distributed ledgers. In the past, if one got into a car accident, the process of getting a claim was painful and long and involved several lengthy and complicated documents, including several hours on the phone with an insurance agent. However, now all of that can be done through your mobile, thereby reducing processing time for claims significantly. This has also opened up an entirely new field of “smart contracts”, whereby; policies developed are fully automatic and are updated using a database. So automation, analytics, and consumer preferences are transforming claims processes, enabling insurers to improve fraud detection, cut loss-adjustment costs, and eliminate many human interactions.

2/4 digital transformation planning

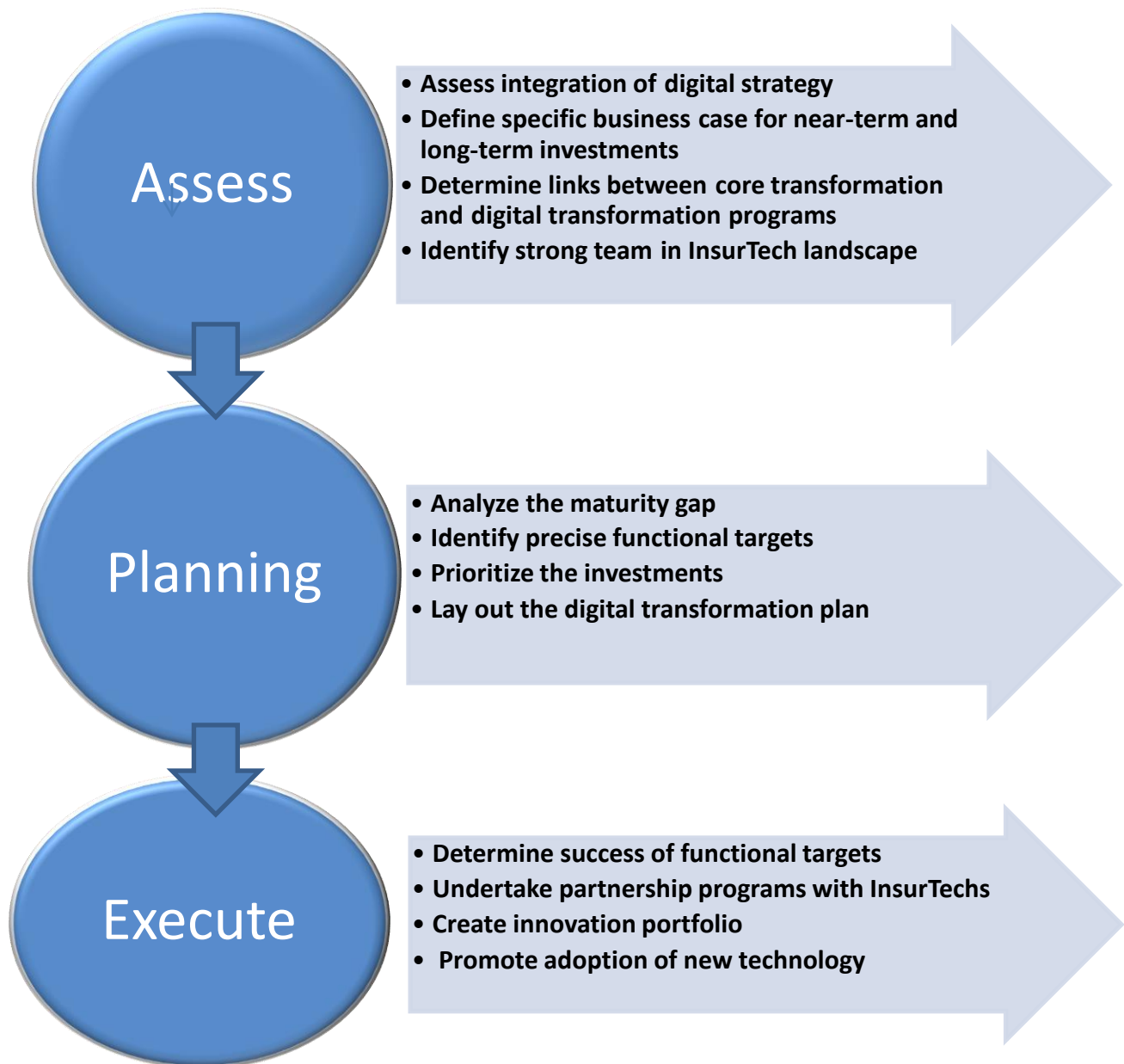


Figure 3

2/4/1 Assess (Starting the Digital Transformation)

Many insurers have already begun piloting new customer journeys, which is an ideal place to start on the overall digital transformation process. Customer journey pilots must be the first step because they have immediate customer impact. Insurers should begin with the most important customer journeys based on the number of transactions,

expected efficiency gains, and qualitative criteria such as impact and organizational buy-in. The integration of digital technologies pointed the way to increasing table sizes, which had a direct and measurable impact on employees ability to produce. Start by reviewing your organization's overall communication or strategic plan to see how digital can reinforce that work. Insurers can in this stage develop objectives that are specific, measurable, achievable, realistic and time-bound.

Who are your priority audiences?

What are you trying to mobilize them to do?

Where can those audiences be found and engaged?

2/4/1/1 Assess integration of digital strategy:

What you know about your organization's digital outreach your plan should answer these questions:

- What forms of digital communications do you use? (i.e., social media, email, SMS/mobile, web, search, blogs?)
- Are you tracking metrics for your digital outreach?
- If yes, do you alter your content based on what the metrics tell you?

2/4/1/2 Define specific business case for near-term and long-term investments

Managers dislike making investment decisions based on assumptions about soft benefits. Using traditional ROI calculations, you might not be able to persuade budget holders to invest in digital initiatives. As a result, insurance company's risk underinvesting in transformational projects²².also traditional ROI models work poorly for transformational digital investments. Traditional ROI models don't

²² Dan Bieleran M.Sc. in economics and B.Sc. in economics from the London School, Building The Business Case For Your Digital Investments

effectively capture many of the benefits that transformative investments deliver. Yet these soft benefits are central to digital transformation activities.

for near-term investments: Insurers must be focused and bold within their progressive approach to digital transformation, as it is the way to generate quick wins and create near-term value that can be invested in the next steps. Each step along the digital maturity curve enables future gains. Rather than waiting to be passively disrupted, truly digital insurers move boldly and proactively, testing and learning in pursuit of innovation, and redesigning operations, engaging customers in new ways and seeking out new partners.

- **For long-term investments:** digital Transformative investments tend to play out over the long term and have broad implications for business processes across the entire value chain. This is where more accurate ROI calculations become critical, as:

- ✓ Insurance company's digital investments need to reflect its vision. Insurance company's vision forms the guiding light for developing the right investment strategy for digital transformation.
- ✓ In a day-to-day context, budget decisions for digital investments hinge on the ability to track the financial return on these investments. Of course, insurance companies can only evaluate the impact of what you can measure, so businesses must be able to calculate the ROI of digital investments to justify that spending. However, calculating the precise ROI for digital transformation at a group level is nearly impossible.

2/4/1/3 Determine links between core transformation and digital transformation programs

For many insurers, core transformation programs are still underway, even as they recognize a clear need to do more. Linking digital transformation programs to core transformation can help insurers use resources more effectively and strengthen the business case. Waiting for core transformation programs to be completed and then taking up the digital transformation would likely result in many missed performance improvement and innovation opportunities, as well as higher implementation costs. Within the digital transformation Program Framework, goals and objectives need to be clearly articulated through a transformation roadmap with a communications plan. Project managers must be aligned to the roadmap and have clear lines of responsibility to coordinate people, processes, and tools for program resource management, accountability, quality assurance, financial forecasting, and program efficiency.

2/4/1/4 Identify strong team in InsurTech landscape

A strong team is essential to making a digital strategy succeed. If staff wears many hats, make sure they have enough time to meet objectives.

- Create a work plan to prioritize their time, based on your objectives.
- Determine which staff will be responsible for analytics, which will conduct outreach, and which will determine the strategy.
- Define how digital staff interacts with other departments and senior management so that digital is part of the core organizational culture, not an afterthought.

2/4/2 Planning

In this phase of the digital transformation process, insurers create the foundation on which the complete transformation will rest. The customer journey provides the underlying focus of the enabling effort, which involves creating new customer journeys in rapid succession. This phase has two components—transforming the operating model and industrializing the digitization process—that should be undertaken even as the

implementation of new digital customer journeys is taking place. The scope of these changes in digitization transformation requires a difficult and complex roadmap, to be clearly defined and agreed upon with all the entire insurance company this phase consisted of:

2/4/2/1 Analyze the maturity gap:

what maturity gaps—it is such as the lack of such business capabilities as brand innovation or customer value creation—need to be addressed in order for them to realize them. We understand that digital transformation is a journey involving a complex ecosystem of capabilities. In each phase of transformation to help identify where there are gaps, establish key areas to focus on, and where to start. Gaps are assessed by a rigorous digital business readiness framework²³.

The digital team members define meaningful and actionable problem statements to be solved and prioritized and to benchmark the current digital status against their aspirations and other relevant parties, and provide a comprehensive readiness and ‘gap’ map, which paves the way for systematic planning of the digital transformation processes. Connecting the assessment of an organization’s digital maturity gaps with empathy-driven, actionable and measurable opportunities requires a capability mapping and prioritization process known as ROADS Principle Architecture Thinking. Armed with this perspective, It starts with the digital transformation leaders of an organization can proceed to determine exactly (and in every facet of the business) where they need to make improvements in order to achieve its desired future state and articulating challenges and values goals through a review of the organization’s business motivation, digital maturity gaps and desired customer and employee journeys. This applies a business architect lens to define value-driven business activities—called value streams—and maps those to enabling business capabilities and associated. To close the

²³ *Gartner Research Note G00333254, Hung LeHong, Graham Waller, 30 June 2017*

gaps through improving, redeveloping or refining the organization's specific capabilities yet by closing the maturity gaps it will incremental the profitability that can be achieved.

2/4/2/2 - Identify precise functional targets:

To set the organization's sights at the right level, investments need to be linked to clear, Identify precise functional ambitious targets and micro services this helps on three fronts.

- First, it signals the magnitude of what digital technology can deliver. Without targets, people who find it hard to accept that the old ways of doing things were massively inefficient might be content to sign up for a 10 percent improvement in cycle time, for example, when 100 percent is possible. External benchmarking can help in this respect by reinforcing the conviction that cutting the time it takes to, say, process a claims submission from 90 minutes to 20 is not good enough if someone else has reduced it to four. A company can be certain that if it does not match that benchmark soon, others will.
- Second, setting clear functional targets and micro services at the outset prevents back-sliding when the going gets tough. In addition, it imposes discipline on the process of deciding which initiatives to pursue for maximum impact.
- Third, functional targets and micro services are needed for each source of value creation—cost savings, revenues, improved performance of agents, and satisfaction of employees and customers—and for new ways of working and the new capabilities required.

often the precise functional targets and micro services can be raised during the course of the transformation as prototypes reveal greater productivity improvements than have been assessed on paper .Which also helps to concentrate effort and attention on what works well and push to achieve more

2/4/2/3 Prioritize the investments:

One key challenge is the industry's lack of standardized methodologies and metrics to assess digital maturity. With unclear visibility, insurance leaders will have a difficult time knowing where to prioritize investments or recognizing the most compelling parts of the business case for digital transformation. However, because digital transformation is a long and continuous journey, most insurers are best served by a phased or progressive approach. This is not to suggest that culturally risk-averse insurers adopt even more caution. Rather, it is to acknowledge that complete digital transformation at one goes can't be managed; there are simply too many contingencies, interdependencies and risks that must be accounted for. Through the roadmap for transition planning, which will be mentioned in the following paragraph (2.4.2.4), organizations are helped to move efficiently from initial assessments to priority-driven trade issues and priority investments in implementation and change management. ROI can take relatively short, fast and cost-effective time to implement, such as innovative investments to accelerate customer satisfaction, employee satisfaction or revenue, or it may take a very long time to be justified by measuring and comparing the costs and benefits of digital investments. Therefore, an adequate budget must be provided to balance the maintenance of existing infrastructure with digital innovation investments. A portion of the budget may need to be allocated to investments throughout the budget cycle, since specific innovation costs may not be known at the beginning of the planning period.

2/4/2/4 Lay out the digital transformation plan:

From above (Analyze the maturity gaps, identify precise functional targets and prioritize the investments), the digital transformation plan should be developed. This plan should contain information previously collected on. The following proposal, consisting of step-by-step transformation plan, will constitute as the answer the research question. This proposal is built using Parviainen et al.'s (2017) transformation model as a foundation²⁴,

²⁴ Parviainen, P., Tihinen, M., Kääriäinen, J. & Teppola, S. (2017). Tackling the digitalization challenge: how to benefit from digitalization in practice. *International Journal of Information Systems and Project Management*, 5(1), 63-77. doi:

extended with the transformation model from Bouée and Schaible (2015) and the findings from previous research and interviews with employees from a process layout company²⁵.

- **Step1:** Define actions to close the defined gap. The actions that can be taken are listed in table 3.

Internal efficiency	External opportunities	Disruptive change
<p>Optimizing or re-defining the processes by using new technology, such as IT- tools. Not only digitizing current way of working, but to define functionalities to optimize digital opportunities. To improving business, consider which processes would have the highest potential to benefit from digitalization and the criticality of the processes. To better meet new business targets, Key performance Indicators should be re-evaluated and updated. Educate the employees about the concept of digitalization, possible benefits, drawbacks, and how they are expected to be affected. Give the employees the opportunity to give their viewpoints and inputs, so the goals are determined in a way that it will benefit all hierarchical levels of the company. Use feedback from employees to create user friendly systems.</p>	<p>Analyzing new, potential markets, defining and developing new offers, acquiring new competencies, and rearranging internal resources. Search for future market participants to cooperate with.</p>	<p>Analyzing new, potential markets, defining and developing new offers, acquiring new competencies, and rearranging internal resources. Search for future market participants to cooperate with.</p>

- **Step2:** Implementing a channel strategy that addresses the risk of low usage of digital services. It does this by developing a traffic concept for steering incoming transactions into digital channels. The traffic concept must ensure that:
 - ✓ Traffic is routed to digital channels either within specific customer interactions or through overarching measures such as search engine optimization or advertising in printed materials and on the homepage.
 - ✓ Digital customer journeys have tangible advantages for customers compared with non-digital ones.
 - ✓ Determine the number of enough customers to create network effects as more people join in.

- **Step3:** another aspect of transforming the operating model is steering, which must address a lack of business coordination by determining end-to-end delivery responsibility for customer journeys rather than following the logic of internal processes, This can be done by measuring the customer satisfaction score—operationalized by KPIs such as processing time and immediate resolution ratios—to obtain actionable insights.

- **Step4:** one of the most important components of a transformed operating model is the implementation of a service infrastructure adapted to the requirements of the newly designed customer journeys. Key components of the required infrastructure are text and voice recognition (to turn non-digital and unstructured data into a digital format), input management, business process engines, an omnichannel service desk, and straight-through processing.

- **Step5:** Analyze the feasibility of the identified actions and prioritize them to determine what actions to carry through first.

As a first step of analyzing the actions, the following bullet points should be analyzed in the feasibility analysis.

- ✓ Cost-benefit analysis (e.g. technology needed for digitalization, training and support for staff involved in digitization work, maintaining the digital data, and costs related to changing the way of working)
- ✓ Impact analysis on existing practices
- ✓ Offerings and resources
- ✓ Risk analysis
- ✓ Analysis of constraints
- ✓ Trials and prototypes of potential solutions

The actions that fulfills most of the following criteria should be prioritized.

- ✓ The actions that align with stakeholders' opinions
- ✓ The actions that align most with the company's ability to change
- ✓ The actions that would create the largest benefit out the digitalization project
- ✓ The actions that would cause the least interference with the current processes
- ✓ The actions that takes the least amount of time to complete
- ✓ The actions that relates to the areas where most time is spent on unnecessary tasks

2/4/3 Execute

In the light of the information gathered in the development of the plan. And being clear with: insurers now know where they are going now, what they want to achieve with this, and why they are doing this. Because if the individual understands why to do certain things, it will be easier to start working with new things, at this point we need to deal with four key issues must be addressed for digital transformation plan execution.

2/4/3/1 Determine success of function targets

At this stage, data collection and analysis are, where the technology team determine the most successful ones of function targets, which should be centers of excellence and developed by the team to integrate them into new and agile ways of working.

2/4/3/2 Undertake partnership programs with InsurTechs:

Given the lagging position of many insurers in digital transformation, the industry is seeking new options for advancing their digital capabilities. Those options include partnerships or acquisition with FinTechs and InsurTechs. Other companies are investing in FinTechs, creating their own internal innovation labs or collaborative partnerships with technology leaders outside the industry. The creation of industry “utilities,” where individual companies or groups of insurers offer actuarial as a service, also has strong potential upside. As digital transformation looks different at different insurers, these are all valid strategies to achieve it.

2/4/3/3 Create innovation portfolio:

Insurers today must offer a wider portfolio of products for them to stay relevant to consumers looking for high degrees of personalization. Innovative portfolio management techniques and the ability to establish product “factories” are critical to designing better products and delivering them to market faster. Innovation isn’t just about products, of course. Digital transformation programs may drive innovation in back-office processes, too (fully automated claims management processes, etc.). They can also enable future innovation by removing technology barriers. For example, better integrated data from sensors deployed within automobiles or buildings can make for smarter underwriting, as well as providing the impetus for innovative product models, such as pay-per-use policies. Similarly, peer-to-peer insurance has become possible through the adoption of digital communities on social media.

2/4/3/4 Promote Adoption of new technology:

Nowadays, with the advent of the digital revolution, products and services are being introduced so much faster. The adoption rate of new technology is so much quicker that consumers have higher expectations in terms of insurance companies’ digital output and functionality. The rates of change and adoption are much steeper than ever before.

Insurers have to build compelling capabilities via digital models in order to be relevant in the marketplace. In this stage, insurers trail the entire digital spectrum: customer engagement, use of analytics, and adoption of mobile and social media.

- **Bottom line: thinking and acting transformatively:** The purpose of this chapter was to present a step-by-step transformation model for insurers with a process layout. This study extends the already proposed transformation model by Parviainen et al. (2017), since this transformation model was the most extensive and detailed. The research gap found in the literature review was that current transformation models for digitalization was too general and lacked practical appliance. Insurers that is to expect a learning curve, change in competency, and parallel work for employees during a digital transformation and implementation. These phenomena are therefore included in the risk analyzes for future scenarios in the model. Furthermore, a list of how to prioritize the actions to reach digitalization has been identified, where the action that fulfill most of the bullet points should be prioritized.

Chapter 3

The blockchain

Introduction

Despite the rise of online brokers, many consumers still call insurance brokers by phone to purchase new policies. Policies are often processed on paper contracts, which means claims and payments are error-prone and often require human supervision. Compounding this is the inherent complexity of insurance, which involves consumers, brokers, insurers and reinsurers, as well as insurance's main product — risk. Each step in this collaborative process represents a potential point of failure in the overall system, where information can be lost, policies misinterpreted, and settlement times lengthened. Enter blockchain technology, which is receiving increasing attention from academy and industry, since it is considered a breakthrough technology that could bring huge benefits to many different sectors. The most important benefit is the provision of a cryptographically secure form of shared record keeping. Insurance is one of the sectors that, among others, started to carefully investigate the possibilities of blockchain. For this specific sector, however, the hype cycle shows that the technology is still in the innovation trigger phase, meaning that the spectrum of possible applications has not been fully explored yet. Insurers, as with many other companies not necessarily active only in the financial sector, are currently requested to make a hard decision, that is, whether to adopt blockchain or not, and they will only know if they were right in 3–5 years. The objective of this paper is to support actors involved in this decision process by illustrating what a blockchain is, analyzing its advantages and disadvantages, as well as discussing several use cases taken from the insurance sector, which could easily be extended to other domains. In fact, the idea of a decentralized, secure and transparent ledger distributed among users can be relevant to many different fields. The insurance

industry, with its highly complex processes, could be a major beneficiary of the technology.

3/1 What is blockchain?

A blockchain is a distributed ledger maintained by network nodes, recording transactions executed between nodes (i.e., messages sent from one node to another). Information inserted in the blockchain is public, and cannot be modified or erased²⁶. Smart contracts are self-executing contracts (generally saved on a blockchain) whose terms are directly written into lines of code²⁷. Recently, blockchain and its relations with smart contracts has received increasing attention from media, which started to address it, as “Blockchain is a relatively new form of technology that acts as an incorruptible digital ledger and keeps a virtual record of all data and transactions²⁸. Broadly speaking, as a digital ledger, blockchain can record a wide range of quantities, from physical assets to electronic cash²⁹. Insurance business is built in large part on policyholders' trust in the accountability of insurers. Incidents that compromise the protection of policyholders' personal and proprietary data may not only result in regulatory consequences for the defaulting parties, but also undermine the policyholders' confidence in the sector. But Blockchain technology design to broadly believed to be secure, the integration of blockchain into insurers' databases may help to cater to the sector's need for data integrity and management and facilitating cross-company data sharing for the specific purpose of reducing fraud and money laundering in the sector. The insurance sector, as with many others, started to

²⁶ Swan, M. **Blockchain: Blueprint for a New Economy**; O'Reilly Media: Newton, MA, USA, 2015.

²⁷ Szabo, N. **Smart Contracts: Formalizing and Securing Relationships on Public Networks**. *First Monday*, Volume 2, No. 9. 1997. Available online: <http://firstmonday.org/article/view/548/469> (accessed on 19 February 2018).

²⁸ Ramada, M. **For Insurers #Blockchain Is the New Black**. Available online: <http://blog.willis.com/2016/12/for-insurers-blockchain-is-the-new-black/> (accessed on 29 December 2017).

²⁹ Duvivier, P.J. **Is the Blockchain the New Graal of the Financial Sector?** Available online: <https://www.linkedin.com/pulse/blockchain-new-graal-financial-sector-pierre-jean-duvivier> (accessed on 29 December 2017).

investigate the application of blockchain technology through considerable investments from both big and small companies^{30,31}, investigations from consultancy firms^{28,32,33}, and the creation, in 2016, of the B3i, the first blockchain-centered insurance consortium. The hype cycle for the insurance sector³⁴, however, depicts blockchain technology at the beginning of the curve connecting the technology trigger phase with the peak of inflated expectation, meaning that this technology has not been fully explored yet in this particular sector. Hence, the questions that insurance companies are asking themselves right now are “Are there clear use cases exploiting blockchain technology and smart contracts in the insurance sector?”, “In case we want to adopt a blockchain, what is the most suitable blockchain architecture for our needs?” and, more in general, “Is blockchain technology mature enough for insurance?”. It has been estimated that they will need to wait about 3 to 5 years to see whether they made the right choice today by deciding to invest or not in blockchain for their business. The objective of this chapter is to help insurers to providing an overview of blockchain- (and smart contracts-) based use cases in such specific sector and by highlighting strengths, weaknesses, opportunities and threats for this technology. In fact, the aim is to stimulate reflections and discussions on this topic, leaving to the insurers the final judgment on the actual benefits that could come from the adoption of the considered technology in a specific scenario.

³⁰ Higgins, S. Insurance Giant Allianz France Exploring Blockchain Potential. Available online: <http://www.coindesk.com/allianz-france-exploring-use-cases-with-blockchain-startup/> (accessed on 30 June 2016).

³¹ Insurance Times Newsdesk. AXA Leads \$55m Investment in Blockchain. Available online: <http://www.insurancetimes.co.uk/axa-leads-55m-investment-in-blockchain/1417270.article> (accessed on 29 June 2016).

³² Shelkovnikov, A. Blockchain Applications in Insurance; Deloitte Report; Deloitte LLP: London, UK, 2016; pp. 1–2.

³³ Lorenz, J.-T.; Münstermann, B.; Higginson, M.; Olesen, P.B.; Bohlken, N.; Ricciardi, V. Blockchain in Insurance-Opportunity or Threat? McKinsey & Company Report; McKinsey & Company: New York, NY, USA, 2016; pp. 1–9.

³⁴ Gilbert, S. The Hype Cycle of Insurance Disruption. Available online: <http://insurancethoughtleadership.com/the-hype-cycle-of-insurance-disruption/> (accessed on 29 December 2017).

3/2 How Blockchain Works

The blockchain (literally, a “chain of blocks”) made its first appearance in the research scenario in 2008, in the frame of the Bitcoin initiative^{35, 36}. The objective was to transfer online payments from one party to another, without relying on intermediaries. In this context, the blockchain was acting as the underlying ledger recording Bitcoin transfers and guaranteeing, by means of cryptographic operations, the authentication and non-repudiation of payments. Even though Bitcoin is, by far, the most famous cryptocurrency, it is not alone. In fact, since 2008, more than 1300 cryptocurrencies have been created³⁷, which are being used as exchange tokens in many different blockchain-based applications. The core concepts behind the blockchain technology are reported in the following:

- Transactions: each cryptocurrency transfer from one subject to another is represented as a transaction from A to B. Cryptocurrency is neither a physical nor a software object, but the result of incoming and outgoing transactions. For this reason, the blockchain keeps track of all the transactions occurred from its birth.
- Blocks: transactions are grouped in blocks. Each block collects all the transactions occurring in a given timeframe and keeps a reference to the preceding block (that is where the concept of “chain” comes from).
- Nodes: instead of being stored in a centralized database, the blockchain is spread over network computers (the “nodes”), each containing a local copy of the entire blockchain.
- Majority consensus: since a central authority is missing, decisions on the network are made according to a majority consensus. Each node modifies its local copy of the blockchain to make it mirror the status of the majority of the network nodes.

³⁵ Nakamoto, S. *Bitcoin: A Peer-to-Peer Electronic Cash System*. 2008. Available online: <https://bitcoin.org/bitcoin.pdf> (accessed on 19 February 2018).

³⁶ Lischke, M.; Fabian, B. *Analyzing the bitcoin network: The first four years*. *Future Internet* 2016, 8, 7. [CrossRef]

³⁷ CoinMarketCap. Available online: <https://coinmarketcap.com/> (accessed on 30 December 2017).

- Mining: nodes could either passively store a copy of the blockchain, or actively take part to the maintenance of the blockchain, in the so-called “mining” process. During mining, nodes check previous transactions to verify whether a subject is entitled to spend a given amount of cryptocurrency and, each time a block has to be added to the chain, solve a complex computational-intensive mathematical problem. This problem was specifically designed to limit the possibility for a malicious entity to manipulate the blockchain by falsifying transactions. The probability of attacks is extremely low, since adding a new (malicious) block or modify a previously added block to the chain would require control of the majority of the network nodes (to make them agree with the modification).
- Wallet: people transfer cryptocurrency using wallets. Cryptocurrency cannot be stored on a physical memory; rather, it is the result of previous transactions. Hence, the wallet only stores credentials (a complex, unchangeable combination of automatically assigned numbers and letters), which enable blockchain users to transfer cryptocurrencies they own. Each wallet is associated to one (or more) unique addresses. Should a user want to send a given amount of cryptocurrency to
- a peer, he/she would have to specify the recipient’s address and the desired amount, and use his/her credentials to validate the transaction. This aspect is particularly important, since in case of credentials loss, the cryptocurrency owned by the user would not “disappear”, but the user would be no more able to spend it. Moreover, the fact that the user validates the transaction with his/her credentials certifies that he/she was the actual initiator of the transaction. In order to better understand how the blockchain works, it could be worth considering the example shown in Figure4

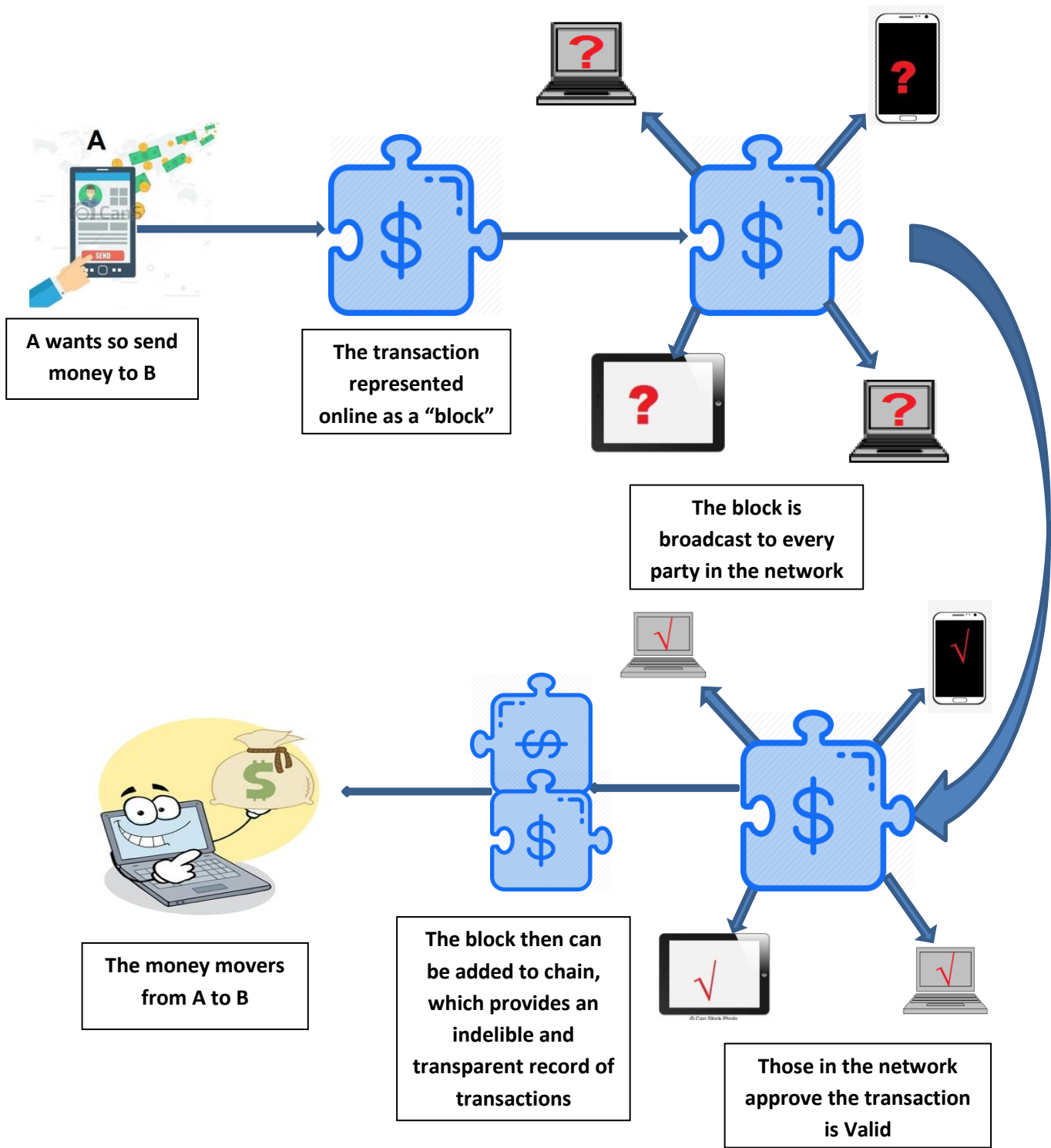


Figure 4

3/3 The impact of blockchain in insurance industry

Blockchain technology can help insurance companies overcome today's challenges and create transparent operations built on trust and stability. In particular, a selection of the examples discussed below are just the tip of the iceberg. Aiming however, is to shed light on the possible impacts on the insurance value chain. That could potentially benefit from blockchain technology will be introduced. Aiming however is to shed light on the possible impacts on the insurance value chain.

3/3/1 Improvement of Customer Experience and Reduction of Operating

Costs:

In this use case, blockchain and smart contracts could be exploited to increase the speed of claim processing as well as to reduce the costs (and mistakes) associated with the manual processing of claims. From this perspective, a smart contract could encode the rules for enabling the transfer of refund from the company to the insured. A simple application could consist of triggering an automatic transfer of refund only if the customer repairs the car at a certified mechanic, with the mechanic sending a transaction to the smart contract to prove its identity. More complex use cases could also involve oracles to gather information from the real world. To make an example, in crop insurance an oracle could periodically check weather data and push this information in the blockchain. A smart contract could then read these data, and trigger a payment in case of persistence of bad weather. These problems have been dealt with, In this case, the focus is on travel insurances, and the idea is to exploit a smart contract developed on the blockchain for automatically refunding travelers if their flight/train was delayed. Another advantage would come from the fact that everyone could inspect the smart contract. That is, the customer undersigning a policy would get a clear idea of its contractual conditions (even though, at the moment, he/she should master some programming skills in order to understand the

smart contract code). Consequently, it would become easier for him/her to compare policies. Furthermore, the choice of a policy would no more based only on how much he/she trusts a given company (since trust would be implicitly guaranteed by the smart contract), but on objective data. Despite these advantages, it must be said that the scenario above could be adopted only for a limited number of policies. In fact, the majority of claims processed by insurance companies still need to be evaluated by an external expert before being settled. In case of manual processing, however, the customer experience could still be improved by managing payments in cryptocurrencies, whose transfer would be quicker than with traditional methods (several seconds or minutes depending on the blockchain used). From the architectural point of view, probably the most suitable choice is blockchains could be used to record policies and claims data, trigger the refund. Also blockchain could be successful choice in case the company needs to improve its own reputation and obtain customers' trust (as the process would be fully decentralized), but would imply higher transaction costs.

3/3/2 Data Entry/Identity Verification:

The blockchain could be used to reduce the overhead related to manual data entry and verification of new customers³⁸. With the blockchain, customers would be identified by a unique address (e.g., the one linked to their wallet). The first time they use a service; a certified intermediary would verify their identity and link it to their address. From that time on, every time they undersign a policy, they would no more need to provide an identification document; rather, they would only need to use their credentials.

Benefits of this use case could be seen again in a reduced time and cost to gather/provide information. Nonetheless, this use case also has some relevant drawbacks the company should be aware of. A first drawback is related to the possible loss/steal of credentials.

³⁸ KYC-CHAIN. KYC-CHAIN Web Page. Available online: <http://kyc-chain.com/#> (accessed on 29 December 2017).

As said, since the blockchain works without intermediaries, no one could reset users' credentials. A solution could be to rely on external services, which could store credentials and return them to the users in case of loss. However, using such services would mean providing someone else access to one's sensitive information. Another drawback is linked to the fact that the current legal regulations should be modified to include blockchain-based identification, and some governments could refuse to approve this type of identification, e.g., due to mistrust in the technology.

3/3/3 Premium Computation/Risk Assessment/Frauds Prevention:

In this scenario, the blockchain is used to let multiple certified intermediaries record information related to a person (by linking them to his/her address). Such intermediaries could be insurance companies (e.g., to record previous claims), criminal record (e.g., to store criminal acts), medical staffs (e.g., to record a person's injuries and treatments), or even smart wearable devices (which could inject in the blockchain data about one's physical activity). A smart contract could read all the information linked to a person and automatically compute the premium and perform risk assessment, based on his/her physical health, driving behaviors, etc³⁹. Another application scenario is represented by fraud prevention. In this scenario, a smart contract could analyze collected data and identify frauds during claim processing (e.g., by crossing data related to a person's previous claims). A scenario such as the one depicted in the above examples, however, could be difficultly realized in the short term. In fact, it implies that each person possesses a unique blockchain address (as presented in Section 3.2), and requires the active involvement of different actors (insurance companies, police officers, medical staff, etc.) as the quality of the results would be a consequence of the quality and quantity of data stored in the blockchain. Privacy is another relevant issue (especially for what it concerns medical records). In this view, in the construction of such a system, a

³⁹ Reply. Insurechain. Available online: <http://www.reply.com/en/content/insurechain> (accessed on 29 December 2017).

thorough attention should be devoted to let only selected actor's link information extracted from the blockchain to a person's identity. Furthermore, particular care should be devoted to the definition of common standards to record the information, in order to enable interoperability. The most suitable architecture for this use case is a consortium blockchain. The blockchain would be maintained by selected nodes of the consortium, e.g., belonging to the different actors involved. The limited number of trusted nodes would increase security and privacy. Furthermore, the blockchain would keep track of the sender of each transaction. Finally, being controlled by a small number of nodes, mechanisms to revert blockchain state in case of transactions erroneously made (e.g., a medical record notified to the wrong person) could be devised.

3/3/4 Pay-Per-Use/Micro-Insurance:

Smart contracts- and blockchain-based payments could enable new revenue sources, such as micro and pay-per-use insurances. Though in the past micro-insurances were threatened by administrative costs, the exploitation of smart contracts could enable quick and cheap policy undersignment and management (even on mobile devices)⁴⁰. Similarly, pay-per-use insurances could become a praxis, possibly in combination with IoT solutions for automatic undersignment (we will talk about IoT in more details in the next chapter 4). For instance, GPS data could be used to automatically collect, e.g., a travel premium only if the customer is abroad, a car premium only when the car is moving, etc. Pay-per-use mechanisms could be exploited in services such as Uber, e.g., activating the service when a customer is picked up or hosted. With respect to the other use cases described in the paper, from the point of view of actors and technology to be involved, this is probably one of the quickest and easiest to be realized (because of the limited number of involved actors, and because the feasibility of prototypal solutions has already been demonstrated⁴⁰). Moreover, from the point of view of the insurance

⁴⁰ Lamberti, F.; Gatteschi, V.; Demartini, C.; Pelissier, M.; Gómez, A.; Victor, S. On-demand Blockchain-based car insurance using smart contracts and sensors. *IEEE Consum. Electron. Mag.* in press. 1–6.

company, introducing blockchain-based pay-per-use insurances (which could be even paid by using cryptocurrencies) could bring a competitive advantage, especially attracting young, technology enthusiasts. Concerning architectural choices, companies aiming at addressing pay-per-use insurance could rely on blockchain. In this way, a smart contract could collect money from customers, keep them until a given date and transfer them to the insurance company if no damage occurs. Being on blockchain, everyone could inspect the smart contract code, increasing trust between parties.

3/3/5 Claims prevention and management:

Alongside big data, mobile and digital technologies, blockchain is essential to establishing an efficient, transparent and customer-focused claims model based on higher degrees of trust. Within claims prevention, new data streams can enhance the risk selection process by combining location, external risk and analytics. A distributed ledger can enable the insurer and various third parties to easily and instantly access and update relevant information (e.g., claim forms, evidence, police reports and third-party review reports). The use of data from a mobile phone or sensors can streamline claims submission, reduce loss adjuster costs and increase customer satisfaction, with blockchain systems facilitating communications and coordination among all parties. Consider how sensors can trigger alerts to insurers that a crash has occurred (thereby initiating a new claim), and then route secure and relevant data to preapproved and conveniently located medical teams, towing services and/or repair garages. Here again, blockchain is the network connecting and ordering data from the multiple devices and apps involved in the multidimensional process. Similarly, the combination of sensor data, satellite imagery, mobile technologies and blockchain could be used to facilitate claims payments and rescue services when natural disasters occur in remote areas. Data from weather stations could determine claims amounts based on actual weather readings, with blockchain enabling greater automation, more efficient data sharing and stronger safeguards against fraud.

3/3/6 Reinsurance:

Over the past few years, most major insurance groups have set up internal reinsurance mechanisms, often in conjunction with the introduction of Solvency II. The use of internal reinsurance enables capital requirements to be reduced for individual entities since the risk is transferred to a captive reinsurer, which may be a separate entity, or a department within the holding company. The insurance group can therefore gain in capital efficiency, as diversification is concentrated at the level of the captive. Internal reinsurance mechanisms often entail swift and complex exchanges of information in accordance with regulatory or fiscal requirements. These information exchanges may involve third parties such as brokers or professional reinsurers, which supply internal transfer pricing for insurance at arm's length. Insofar as there is a natural internal consensus for this type of situation, it may be possible to organize information flows for the internal reinsurance via a private blockchain. By automating the execution of reinsurance treaties through smart contracts, the entities concerned (e.g., group subsidiaries) would no longer need to be involved in the "declarative" phases of insurance (contracts, claims reporting, verification, settlement trigger, etc.).

3/4 weaknesses:

Apart from technical aspects discussed above, other weaknesses affect blockchain usability. First, the impossibility to receive assistance in case of credentials loss (even though this weakness could be partially removed by relying on trusted services. Another aspect is cryptocurrencies volatility, which could become a limitation to the adoption of blockchain-based payments. In fact, given the fact that cryptocurrencies are subject of speculation and considering that technology is not fully mature yet (and bugs frequently appear), value of cryptocurrencies show huge fluctuations. Another weakness is related to the fact that development tools are still in an early stage, and standards for developing blockchain-based applications have not been defined yet.

Finally, It must be said, though, that the blockchain community is devoting great efforts to improving the above weaknesses. Concerning easing the interaction with the blockchain, some applications that let users easily interact with blockchain-based applications using their browsers or mobile phones are currently under development [⁴¹, ⁴²]. Once the above initiatives are successful, blockchain technology could be gradually inserted in everyday lives. In the meantime, insurance companies are strongly suggested to start investigating it, by acquiring the required competencies, and by creating some prototype solutions. Such prototypes could be useful to evaluate how existing processes would be influenced and to what extent this technology would be accepted by the staff or by customers. The short-term effects of blockchain on the insurance industry will be most visible in improved efficiency and cost reductions across the industry⁸. However, as blockchain usage becomes more prevalent in each industry, it will be used by these players to address industry-wide problems and bottlenecks. For the organizations operating within these markets, not having blockchain technology will be a competitive disadvantage, and, over the long term, innovating continuously in this domain will be important in order to stay competitive. Nowadays, insurance customers expect tailored products and services and blockchain could be a significant tool in delivering them, while reducing cost and increasing efficiency and resilience for insurance companies⁴³. The above innovations and progressive ideas are all nice to have, but there is an issue of timing. Blockchain requires heavy IT investment and it could be several years before the most effective uses can be identified and benefits realized. The B3i initiative illustrates how the industry is starting to work together, but more collaboration and communication between insurers, technology experts, regulators and start-ups is needed. Equally, individual insurance companies must determine the most likely use of blockchain, drawing from customer needs and potential.

⁴¹ MetaMask. Available online: <https://metamask.io/> (accessed on 29 December 2017).

⁴² Status—A Mobile Ethereum OS. Available online: <https://status.im/> (accessed on 29 December 2017).

⁴³ <https://www.mckinsey.com/industries/financial-services/our-insights/time-for-insurance-companies-to-face-digital-reality>

Chapter 4

Internet of Things (IoT) business models for Insurance

The concept of sensor-equipped machines communicating independently has been around as early as in the eighties with, for example, a connected Coca Cola machine that transmitted information about the remaining amount of cans and deficiencies to the supplier. But it is only in 1999 that the term “Internet of Things” has been coined by Kevin Ashton, a former P&G technologist, to describe a transformed world as a system where the Internet is connected to the physical world via omnipresent sensors (Ashton, 2011; Madakam, 2015)⁴⁴. However, Ashton believed that Radio Frequency Identification (RFID) was a prerequisite for the IoT, which is not the case for the concept as it is known today. The IoT was first mentioned in the public literature by the International Telecommunication Union (2005) in which the following elements were identified as enablers for the IoT: (1) item identification; (2) the ability to detect changes in the physical state of things; and (3) embedded intelligence (Federal Trade commission, 2015). The almost coincidental genesis of the term has led to the absence of a generally accepted definition and confusion among researchers and other stakeholders⁴⁵. As a result, similarly to other authors writing about the IoT subject,-

4-1 What is IoT ?

We have experienced difficulties to capture the essence of the IoT during our literature review and felt the urge to work on a definition myself. Nevertheless, my proposed definition is: **Internet of Things: it is any object that can be connected to Internet to send data and/or receive data such as (Smartphones, Smart TVs, Computers, cars, Smart, Homes....etc.), Sensors such as (Web Cam, Heart rate or health related sensor, GPS Location, Temperature Humidity sensors....etc.), is just one**

⁴⁴ Ashton, K. (2011). That ‘internet of things’ thing. *RFiD Journal*, 22(7).

⁴⁵ Atzori, L., Iera, A., & Morabito, G. (2010). The internet of things: A survey. *Computer Networks*, 54(15), 2787–2805.

technological advancement that will have a material impact on the relatively static insurance industry.

As was mentioned above, the absence of a generally accepted definition has led to ambiguity, misunderstandings and important aspects got overlooked. This renders necessary for any IoT related research project to precede with a definition proposal in order to avoid any further ambiguity. Today's progress in the field of smart devices and Sensor technologies renders feasible the capture of massive amounts of previously inaccessible data. However, raw data alone is of no value as long as no useful information, insights or knowledge has been extracted from it⁴⁶. Therefore, after collecting such data, data analysis should be done to extract useful information. To recapitulate, for the purpose of this paper, three key building blocks for IoT systems have been identified in the previous sections:

4/1/1 Network connectivity or Communication technologies:

For practical reasons, the insurance companies need to be able to continuously access the collected data in order to conduct its analysis from a remote location in a seamless and inexpensive way, thus explaining the need or the key building block “network connectivity”. Insurance companies typically transmit the collected data over the cellular network with a so-called OBD-dongle, which is device that is equipped with a SIM card and, as its name suggests, is plugged in by the policyholder himself into the OBD-port to access the parametric data.

4/1/2 Sensing technologies:

Sensors have long had many uses outside smart homes and heat detection. Numerous other devices and applications rely on the technology, ranging from distance sensors built into self-driving cars to motion sensors for the protection of industrial facilities and

⁴⁶ Baños-Gonzalez, V., Afaqui, M. S., Lopez-Aguilera, E., & Garcia-Villegas, E. (2016). IEEE 802.11 ah: a technology to face the IoT challenge. *Sensors*, 16(11), 1960.

leak detectors in public buildings. The ability of these sensors to capture and deliver data in real time can create a future where people and companies can observe events and respond with action more quickly than ever before. Sensors also enable a range of popular devices, such as bracelets that track our physical activity over the course of the day to help us improve our health and smart thermostats that learn our habits to customize the temperature in our homes. Ultimately, sensors enable us to more fully understand and control the conditions that affect our lives. Sensor-based devices are also helping insurance companies provide clients with new, customized services that can mitigate risks.

4/1/3 Data analytics:

The accuracy and reliability of the algorithms, formulas, and weights assigned to factors and other actuarial analytical tools to perform predictive and behavioral analytics for premium pricing is the most crucial element because since it directly impacts the insurance company's competitiveness, profitability and ability to differentiate.

4/2 Why it matters for insurance industry ?

The Internet of Things (IoT) could drastically change the Insurance Industry. With 6.4 billion devices already connected, and 5.5 million new devices added almost every month, the IoT's real-time data collection and sharing power will create significant, new opportunities in finer product segmentation, improved loss control and accelerated premium growth. Until recently, the IoT was largely viewed as a futuristic concept with many insurers adopting a "wait and see" attitude. But now in their publication The Internet of Things in Insurance, such a posture is no longer viable. Early adopters have established a clear and compelling value proposition by demonstrating how data from in-home and automotive sensors, wearable technology, drones, GPS, mobile and telematics devices, networked appliances and multiple other sources can help grow new

business, improve risk assessment and proactively engage policyholders in loss prevention also use of IoT and sensor data means insurers have the opportunity to:

- Establish direct, unmediated customer relationships based on direct access to objective and unfiltered data
- Gain more granular and precise understanding of who their customers are and how their needs change over time.
- new offerings of products, features and access options

So far, the insurance industry has been slower than other industries to respond to this rapidly growing data opportunity. Found the following in a recent survey:

Insurers lag in using insights from new data sources(see figure 5)

Percentage of respondents, by sector, reporting that their companies can use insights from new data sources to boost customer value is⁴⁷:

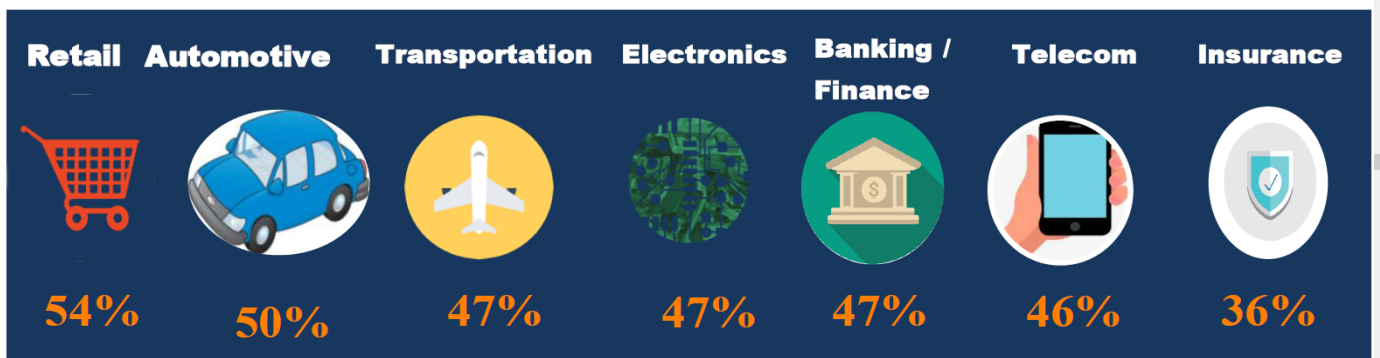


Figure 5

4/3 Cost-benefit analysis:

As with any decision regarding the adoption of a new technology, the potential benefits are to be gauged against the costs, which can be of pecuniary and non-pecuniary nature. This is a particularly important exercise since it lays the basis for the construction of the

⁴⁷ EY-the-internet-of-things-in-insurance

theoretical framework that will be used to answer our research question. First, let's take a look at the policyholder's individual (perceived) benefits, since logically it will be on these that the policyholders, and so potential customers, will base their decision. The benefits for the policyholders mentioned in the papers we consulted were in accordance with one another. The most straightforward benefit is without doubt that it provides an opportunity to the policyholder to pay a lower premium, even if the opposite might happen. The policyholder will pay a more actuarially fair premium and will be given an economic incentive too, also the policyholder may benefit from societal benefits when implemented at large scale. Looking at the costs side, it is undoubtedly the privacy issue that provides the most resistance to the innovative insurance solution. by its IoT nature, requires the capture, transmission and analysis of sensitive data, which can limit its adoption⁴⁸. The policyholders may be concerned whether their personal data, including location and movement habits, will leak or will be shared for commercial purposes. I want to point out that the policyholders will have to determine their Willingness-To-Accept, which is the opposite of Willingness-To-Pay, for compensating the privacy concerns. Reassuringly, some studies have investigated potential solutions or 33 mitigators for the privacy issue, but reviewing these would lead us too far from the main subject of this paper.

⁴⁸ Featherman, M. S., & Pavlou, P. A. (2003). Predicting e-services adoption: a perceived risk facets perspective. *International Journal of Human-Computer Studies*, 59(4), 451–474.

4/4 The Impact of IoT on insurance industry

IoT has the potential to drive fundamental change in the insurance industry (see figure 6).

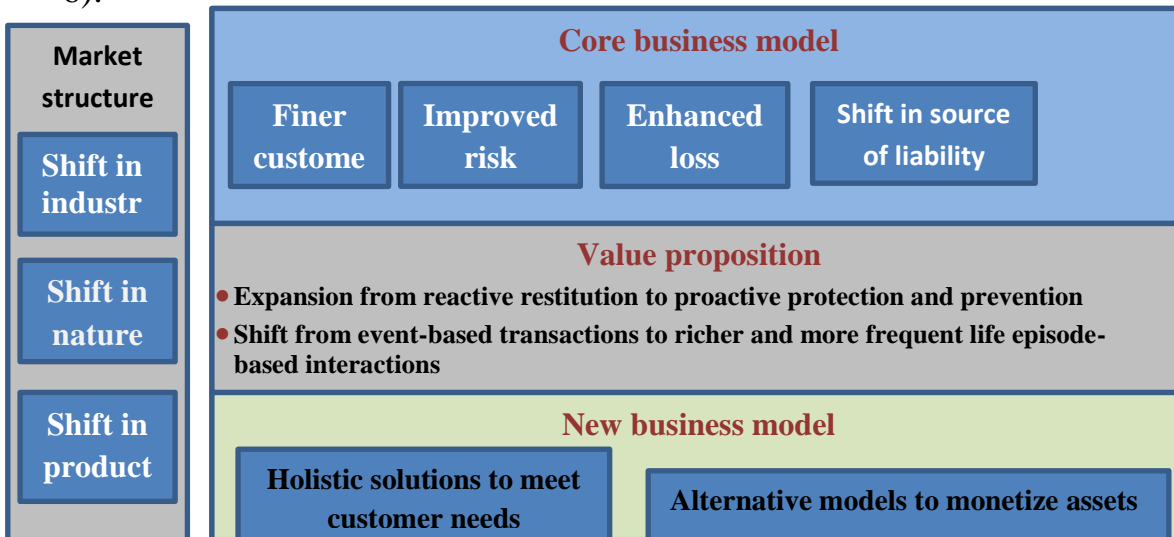


Figure 6

4/4/1 Innovations will shift market boundaries: The new IoT ecosystem of sensors, applications-and the behaviors they provoke-will entice players from disparate markets such as automotive OEMs, home security companies, cable and mobile providers, and insurers to compete across traditional industry boundaries.

4/4/2 IoT will lead to new value propositions that unlock new sources of revenue: Insurers can use IoT-enriched relationships to connect more holistically to customers and influence their behaviors. IoT data will have value beyond insurance for market segmentation, offering customer services related to emergency conditions, lifestyle, or other factors. Always connected lifestyles will also generate new types of risks, such as for information security. The better insurers understand these opportunities and risks, including which ones to cover and how to price them, the more successful they will be in the transformed marketplaces.

4/4/3 IoT can improve the economics of core business models: Economics will improve in several ways, particularly from the use of data analytics to identify and understand risks. Less risky behavior such as safer driving or better roof maintenance will lower preventable losses. For example, speed and miles driven, derived from telematics device, can serve as underwriting factors that improve the loss experience and core business operations, including claims management, servicing, and acquisition. Better, more timely information can make claim payments speedy and efficient, while data analytics can make detection of potential fraud both easier and more successful.

4/4/4 IoT will shrink the traditional insurance market and change the nature of the risk landscape: IoT will provide new ways to avoid preventable losses—some of which will be carved off by new competitors from outside the industry. As insurers begin to provide prevention solutions, the fundamental economics of the industry will shift, and they will incur greater up-front costs to lower loss payouts in the future. The nature of insurable risk will shift to low-frequency, high severity events that are harder to predict and price. These effects are already playing out in selected segments, such as high-net-worth customers.

4/4/5 New opportunities for traditional insurers:

IoT provides traditional insurers with big opportunities to evolve and expand their business models. It facilitates the evolution of the existing insurance business models by:

- ✓ Creating opportunities for better and more frequent customer interactions (e.g., through wearables)
- ✓ Advancing risk assessment (e.g., by considering safety measures like connected home solutions)
- ✓ Enhancing pricing and risk accumulation control
- ✓ Broadening the insurance offering (e.g., cyber risks)

- ✓ Driving efficiency through sensor-based automation (e.g., trigger-based claims payments, apps).

In addition, IoT facilitates the expansion of insurers into adjacent and completely new areas of business – primarily by

- ✓ Offering innovative hybrid solutions in insurance/services offerings (also together with partners from other industries, e.g., predictive maintenance, smart parking, preventive care)
- ✓ Enhancing risk engineering (e.g., industry-specific risk-advisory leveraging of insights based on sensor data)
- ✓ Offering proprietary data and analytics solutions to third parties (e.g., data market-places).

4/4/6 Improving existing business: As sensors and devices proliferate inside the car and, even more so, at home, they will generate a wealth of data, leading to better decision making across many industries, including insurance. In the connected car, which will influence driving behavior and smooth the processes of accident repair, roadside assistance, and car maintenance. Meanwhile vehicle safety and security will improve with systems that can detect imminent collisions and take evasive action, or even interact with road infrastructure and brake for red lights. At home a combination of mobile and sensors across major home systems will provide home monitoring and control solutions that can mitigate preventable losses (such as water hazards) and provide ability to control the home environment (such as lighting and HVAC). In addition, these sensors will provide better information on the condition of the home, improving the timeliness and impact of home maintenance and repairs, and hopefully educating consumers in the process.

4/4/7 Expanding customer value propositions:

Sensor data is rapidly coming online. With the right analytics, this data will provide more complete behavioral- and needs-based pictures of consumers and distinct segments than exists today. Insurers will have the opportunity to develop more holistic value propositions beyond risk management-and indeed may need to do so in order to maintain control of the customer. In both the car and the home, other incumbents are broadening their value propositions. Insurers can do the same, using their data to help consumers make wise purchase decisions and maintain the value of their assets afterwards. A first car or home purchase is a significant customer event, and insurers can build out their value propositions to own the right to advise and serve customers from that point forward.

4/4/8 Claims

The IoT is likely to drive further evolution in claims, as it orients more toward active loss prevention. For instance, in-home sensors can monitor for fire, wind and water damage. In- vehicle sensors can also be useful in providing warnings in case of dangerous driving patterns. Within group health insurance, the discounts offered to employees who monitor their activity levels and heart rates could be considered a claims prevention program. Increasingly, within commercial lines, fitness monitors may feature in office and director insurance. There are also data-driven opportunities to enhance incident management and claims service, such as proactively offering towing or “loaner” vehicles in the event of an accident, rather than just covering these costs.

In five to ten years, the traditional (and still current) business models of the insurance industry can be expected to have greatly changed. Players’ models will either have become IoT focused or will decline. The former will constitute a paradigm shift demanding for a revision of the whole business model and involving complexities on several dimensions. The growing imperative for partnerships, services, and

technological complexity is unprecedented as are the vast IT requirements. There is also a strong demand for innovative working methods and organizational flexibility. This will lead to a massive redistribution of market share and surplus not only within the insurance industry but also across the respective ecosystems. To optimally prepare for the IoT challenges ahead and secure the best opportunities for capturing benefits from this, (traditional) insurers are strongly recommended to immediately start anticipating and estimating the expected range of IoT's impact on their business – and to plan the transformation accordingly (see chapter 3). For those who have the foresight, courage, and will to shape the future of the insurance industry in a world of IoT, there are great opportunities for growth and value creation.

Chapter5

Increasing Use of Value-Added Services

he chapter hand explores the influence of value-added services offered on the customer's preference structure. It addresses the need of insurance companies to extend their core business with different types of supplementary services. However, the insurance sector has not been very engaged in the creation and innovation of new services. Insurance companies simply imitate competitors' modifications in insurance services instead of actively exploring new ways of creating competitive advantages through service innovation. Evidence on the type of innovations initiated by insurance companies support this line of reasoning. Insurance providers are mostly concerned with incremental innovations; cost orientated process innovations in the main sphere include sales, marketing and delivery processes. There is only very limited innovation effort focused on creating new differentiation opportunities⁴⁹. The limited effort being made in the innovation of new insurance services has added to the situation in which customers perceive insurance services as commodities. Customer perception of insurance services and their preference structure is, therefore, dominated by price sensitivity and trade-offs between insurance franchises and insurance fees. A "franchise tariff" is the sum of money up to which the customer pays for a reported claim. The services included in the insurance fee apply if the claim costs exceed the franchise tariff. Growing price sensitivity is also evident in the increasing customer expectation of obtaining "no-claims discounts", i.e. a reward in terms of lower insurance fees, or even a refund, is expected if a claim is not reported to the insurance provider during a certain length of time. Insurance companies have started to extend their core insurance service with different types of supplementary services in order to mitigate the dominance of price awareness on the part of the customer. The first type of service reflects "post-accident" services,

⁴⁹ Hollenstein, H. (2003): Innovative codes in the Swiss service sector: a cluster analysis based on firm-level data, *Research Policy*, Vol. 32 No. 5, pp. 845-863.

which function as a customer service for creating positive experiences in case the insurance company has to support the customer. Such post-accident services maintain a close link to the insurance services. The second type of service can be described as “value-added” services. These are increasingly independent of the core offers and do not primarily address the core insurance services. They aim instead at encouraging the customer to be generally more active, in its participation in the value co-creation and correspond to the idea of using a more service-dominant perspective in an innovation approach⁵⁰.

5/1 Definition

The basic idea behind value-added services is nevertheless rather clear. **Insurance companies aim at maintaining and advancing their competitiveness through value-added services.**

On the one hand and, on the other, wish to use value-added services to influence the customer preference structure for insurance services. The ability to modify the customer preference structure is beneficial for achieving competitive advantages and creating differentiation opportunities. While the competitive argument is widely supported in the literature, little is known of the role of value-added services in the preference structure of the customer⁵¹. The use of value-added services in the present study is closely related to the definition of the companies’ total offers through various layers surrounding core services and goods and, most importantly, through the value-in-use perspective.

Insurance services such as car insurance, health insurance or life insurance represent the core offers provided by insurance companies. These core offers are supplemented by a customer service which accompanies each product and is only relevant if the customer requires the assistance of the insurance service. The insurance sector also describes this

⁵⁰ Michel, S., Brown, S.W., and Gallan, A.S. (2008): *Service-Logic Innovations: How to innovate customers, not products*, *California Management Review*, Vol. 50 No. 3, pp. 49-65.

⁵¹ Payne, A.F., Storbacka, K., and Frow, P. (2008): *Managing the co-creation of value*, *Journal of the Academy of Marketing Science*, Vol. 36 No 1, pp. 83-96.

layer in terms of customer service, and includes the aforementioned post-accident services, hotline, information and consultation services. In the context of the service-dominant logic and the value-in-use concept, customer service would not affect the skills of the customer. Insurers have started offering customers a range of innovative, value-added services related to their health, lifestyle, or property management. As these services require more regular interaction with customers and a more positive context for engagement, they give a great boost to the brand that the insurers build with customers. Insurers are now positioning themselves as risk managers and partners in customers' daily lives, and—in the process—are also gaining a deeper understanding of their customers, which can help them provide better services. Value-added services are, therefore, considered as being important enablers in modifying the prevailing value-in-exchange perspective of insurance services. This perspective emphasizes the fact that insurance companies extract the value of the customer by increasing their variety of aforementioned customer services, where the customer still acts as a passive consumer. Our notion of value-added services implies that the customer is, on the contrary, an active consumer and co-creates value⁵². This chapter uses a conjoint analysis, following the recommendations on assessing customer preferences to increase understanding of how value-added services are embedded in the customer's preference structure.

5/2 Categories of Value-Added Services:

Value-added services in insurance can be assigned to one of four categories:

- **Self-Service:** This category includes services where insurers equip customers with tools and techniques to better manage their insured risk, which may also include the customer's property or their health. These services create a win-win situation for insurers and customers, as customers feel empowered to manage their own risk while reducing the cost of service for insurers.

⁵² Vargo, S.L. (2008): Customer Integration and Value Creation: Paradigmatic Traps and Perspectives, *Journal of Service Research*, Vol. 11 No. 2, pp. 211 - 215.

- **Advice and Assistance:** This category includes services that provide customers with timely assistance in case of need as well as with information that can help them better manage their lifestyles, property, or funds. These services are also generally geared towards preventing or mitigating risk while simultaneously engaging more with customers.
- **Anticipation of Customer Needs:** Some value-added services are designed to fill gaps in the customers' overall journey by anticipating their needs and catering to those needs by providing life-stage based offerings. Insurers can gain greater 'wallet share' by acquiring customers' 'mind share' through such value-added services.
- **Collaboration and Engagement:** Value-added services for collaboration and engagement are primarily focused on fostering deeper customer relationships. By providing truly differentiated services, insurance companies can improve both customer acquisition and retention. Together, these value-added services enable insurers to play a more significant and consistent role in the customer's overall insurance journey.

5/3 Challenges of Value-Added Services:

- **Data Security and Privacy:** Most value-added services involve regular tracking and storing of customer information. As such, they involve concerns around data security and customer privacy. Insurers must be sure to address these aspects when designing the value-added services offerings.
- **Cost of Implementation:** Value-added services may have significant costs associated with implementation and support if they are not purely app-based. They may also involve physical back-end infrastructure and operations. If the value-added services are not monetized, it is important to ensure that the services' costs do not outweigh the benefits.

- **Identifying the Right Portfolio of Services:** Though there is no limit on the type or number of value-added services that an insurer can offer, it will be important for insurers to identify the right portfolio of services that will help them achieve their business goals.
- **Mapping Services to Appropriate Segments:** In order to fully tap the benefits of their value-added offerings, it will be important for insurers to map the services as per the specific characteristics of the target market and customers' level of comfort with digital Do-It-Yourself (DIY) tools.
- **Legacy Systems and Process:** An area of challenge for traditional insurers is the limitations of legacy systems and processes. These can pose a constraint to the implementation of value-added services, which generally require real-time data tracking and advanced analytics.

5/4 The impact of value-added services:

As shown in figure 7, insurers are providing a range of value-added services in the life and health and the property and casualty markets across the four previously defined categories in (5.2).

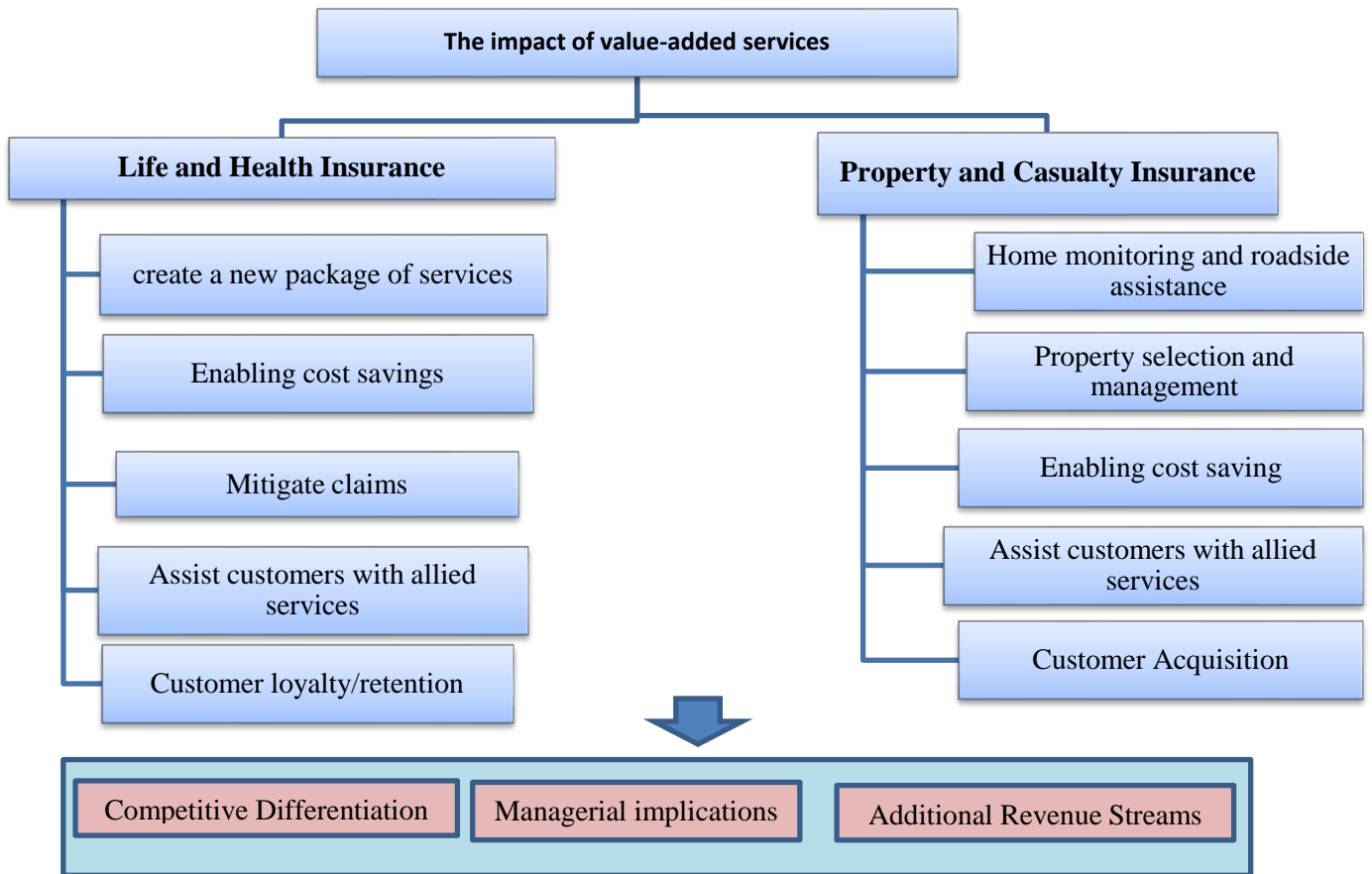


Figure 7

5/4/1 Life and Health Insurance:

5/4/1/1 Create a new package of services:

value added services, make insurers are going beyond offering only an insurance policy by providing a new complementary package of services that can ensure complete care of the customer’s health and safety. This is done by creating an ecosystem equipped with devices and network facilities that help manage different aspects of the customer’s life or health. Such value-added services may involve partnerships with Original Equipment Manufacturers (OEMs), and some extra services may be monetized. Apart from enabling customers with proactive risk mitigation, a package of services like this can provide insurers with a strong competitive differentiation as they can now develop unique offerings that can be

easily differentiated in the market. Customer care packages create a “services ecosystem” that can increase customer retention.

For example: design a care program enables customers to be equipped with care through fall detection technology and medical alert devices, medication sensors and reminders, and remote control of lights and thermostats by the customer’s

5/4/1/2 Enabling cost savings:

A valuable add-on service that insurers can provide to customers is to provide tools that enable greater cost savings. This is a popular value-added service that is gaining traction in the banking industry and will be valued by insurance customers as well. As per the World Fin_Tech Report (WFTR) 2017 Voice of the Customer survey, having access to a “transparent fee structure” was one of the most important “Moments of Truth” for customers, highlighting the need for offerings in this area. Insurance the way we see it Offerings that enable cost savings are an effective means to improve customer acquisition through an attractive value proposition. They may also play a critical role in improving customers’ loyalty towards their insurer by enhancing customers’ experience in an area important to them. In addition, many of the value-added services are directed towards proactive risk mitigation, they can also help lower the overall cost of claims for insurers by helping customers avoid the risks in their daily lives. Value-added services, especially self-service tools, enable insurers to lower their cost per policy – an important metric; particularly for life insurers.

For Example: design mobile application that can helps customers manage their insurance-related expenses by providing suggestions on how they can use the free services in their plan, explanation of surprise invoices, and tips on negotiating bills. The firm thus aims to bring transparency to consumer health insurance plans

and help customers transition to the new individual-focused health insurance system

5/4/1/3 Mitigate Claims:

Apart from proactively mitigating risks through health-management apps, insurers can continue to mitigate the severity of the claims incident by enabling easy healthcare access for customers when they face a health condition. This is done through tools that provide customers with information on the most suitable healthcare options available, or by providing easy access to medicines and healthcare facilities. As such services cater to an important customer need—receiving timely healthcare—firms providing these options can stand out among the competition in the market. Enabling timely healthcare access can significantly enhance customer experience while also reducing claims costs by minimizing the impact of the claims incident.

For Example: some health insurers the medical teleconsultation assistance provides customers 24/7 access through team of their own doctors and nurses for remote consultations. The doctor can send prescriptions if required and can direct the customer to an appropriate medical care provider in case of emergency treatments reducing the number of claims.

5/4/1/4 Assist customers with allied services:

While most value-added services are directed towards helping customers in risk mitigation or providing assistance at any stage in the customers' lifecycle, a few insurers are exploring services that assist customers with other aspects of their life that may not be related to risk at all. Allied value-added services considerably expand the scope of offerings that can be explored by insurers. By providing a really unique and useful offering that is also available to non-customers, insurers can gain access to new markets and build a strong brand with them. Allied

services are also useful in building a deeper engagement with existing customers and obtaining a better understanding of customer preferences.

For Example: design Pharmacy mobile app enables customers to refill their prescriptions anytime, anywhere from their mobile phone and request mail delivery. Users can scan the barcode of their pill bottle to refill prescriptions or set up automatic refills, track their prescription orders and current stock, and receive price alerts for spending above a certain pre-defined limit⁵³.

5/4/1/5 Customer Retention:

Value-added services can help in improving customer retention by enhancing customer experience through regular and meaningful engagement. As the insurance ecosystem is rapidly changing to include new players in the customer interface, customer retention will require a renewed focus by insurers to compensate for their decreased control of customer acquisition.

For Example: One of the insurance companies designed a program that serves as a digital repository for users to share photos and videos with their social networks. The application also allows users to store important personal documents such as passports or financial documents securely on a cloud leading to improving customer retention.

5/4/2 Property and Casualty Insurance:

5/4/2/1 Home monitoring and roadside assistance”

A value-added service for home insurance that is currently attracting a high degree of interest is home monitoring and assistance. Insurers are partnering with Original Equipment Manufacturers (OEMs) to incentivize customers to use smart home sensors that can alert customers of any danger in advance so that property

⁵³ <https://www.humana.com/>

damage can be prevented or minimized. Some insurers also provide customers with assistance in such cases, or they provide tools that help the customer understand and avoid the risks present in their home. Many insurers have also started providing roadside assistance to customers in case of accidents or other emergencies. This includes repair assistance, emergency calling, stolen-vehicle assistance, and even temporary accommodation in some cases. Some of these services are monetized as they incur significant costs for the insurer. In addition to helping insurers address customer risk in a timely manner, these services can also provide an additional revenue stream when the services are monetized. As these services are beneficial to customers and insurers, they create a win-win situation. By making roadside-assistance services available to noncustomers as well, insurers can also benefit by gaining access to a new core-policy customer base through the service.

For example : Some Panasonic sensors can send alerts to the mobile user's device as well as to the insurance company if there is any risk in the customer's home where the company can send the repair teams to quickly address the problem and mitigate the damage caused

5/4/2/2 Property Selection and Management

A value-added service makes Insurers are increasingly helping customers select and manage their insured property. Tools that help customers better maintain their insured property create a win-win situation as insurers also benefit from lower claims costs by preventing property damage. Property selection tools prove to be an effective means to engage with new customers and also help market the insurer's product by sharing information on their quotes for that property.

For Example: Security First Security First Mobile helps alert customers to bad weather conditions that may affect their finances and provide advice to help increase their lives.

5/4/2/3 Enabling Cost Savings

In the Property and Casualty (P&C) market, auto insurance is an area in which insurers are exploring value-added services that enable cost savings for customers. Customers can access apps that help them save on fuel expenses, optimize their trips, and obtain information to prevent incorrect parking. By also making these apps available to non-customers, insurers can attract potential auto-policy customers.

For Example: Knowing the dangers in a proactive manner by mobile applications that emit a nearby warning will occur like many hurricanes or rains. The customer can take the crisis reserves to minimize the damage that may occur in the event that they occur and thereby reduce the cost.

5/4/2/4 Assist customers with allied services:

Like the life and health insurers, P&C insurers are also exploring the benefits of offering allied value-added services. These services may help customers with aspects of their life that are not directly related either to managing risks or to their insured property. By offering unique apps that are useful for customers, insurers can reach out to new customers and obtain a chance to provide them a superior experience and showcase their capabilities as a firm.

For Example: Knowing the risks in a proactive manner by mobile applications that emit a warning of imminent danger will happen like many hurricanes or rains. The customer can take the crisis reserves to minimize the damage that may occur if it occurs and reduce the cost.

5/4/2/5 Customer Acquisition:

Value-added services also provide insurers greater scope for customer acquisition by opening new channels for reaching potential customers. By providing useful mobile apps or digital tools that are not necessarily related to insurance, but find high utility value among users, insurers can gain access to new prospective customers to whom they can cross-sell the insurance product. Mobile apps and digital tools are also a very cost-effective means of customer acquisition as compared to more traditional marketing channels⁵⁴.

5/4/3 Additional Revenue Streams: Some value-added services can be monetized and therefore provide additional sources of revenue. With traditional insurance models likely to become obsolete—driven by forces such as the blockchain and connected technologies—exploring potential new sources of revenue may become very important for insurers.

5/4/4 Competitive Differentiation: Insurers can also leverage value-added services as a means for competitive differentiation. Providing innovative and useful services can help insurers stand out among their competitors and gain greater customer mindshare.

5/4/5 On managerial implications

The most important managerial implications arise from the aforementioned theoretical implications.

Firstly, managers need to modify their approach to innovation. Such modification should be focused on the value-in-use concept and its underlying rationale on innovating the role of the customer regarding the buying, using and paying for insurance services. This represents a huge modification in the approach currently employed. Thus, a

⁵⁴ Golia, Nathan. 2010. "Insurers Launch Games to Engage Consumers on iPhone". *Insurance & Technology*, June 28, 2010. Accessed December 2016. <http://www.insurancetech.com/data-and-analytics/insurers-launch-games-to-engage-consumers-on-iphone/d/d-id/1312124?>

subsequent step toward innovating the role of the customer could be to create a more extensive customer service. Concentrating on customer service creates service-related skills and abilities in insurance companies that, at a later date, can be applied to the role of the customer. It could be considered as fundamental step in creating internal service knowledge.

The second managerial implication is related to the marketing approach which, for insurance providers, means that the customer perceives the presence of value-added services differently. Without knowing a priori to which group a new customer belongs, insurance providers require a strategy of new processes in order to target the segment of customers interested in value-added services.

5/5 Summarization

To summarize, value-added services are of increasing relevance to insurers and may well become one of their core offerings as traditional insurance models may be outmoded by connected technologies. When planning near-to-medium term strategy with respect to value-added services, areas of consideration for insurers may include the following.

- **Tools for Financial Education and Planning:**

- ✓ Customers find insurance to be complex and are increasingly demanding more information transparency. Insurers can provide apps that support financial education and also leverage their investment expertise to advice customers on financial planning.

- **Risk Advisory Services:**

- ✓ Risk-advisory services, wherein insurers can act as risk-management partners for customers even in personal lines, is one of the most attractive type of value added service for insurers as it leverages their expertise in risk management.

- ✓ Risk-advisory services can also help insurers focus proactively on loss prevention, rather than just reacting as a reimbursement agent.
- **Comprehensive Package of Services:**
 - ✓ Providing a comprehensive package of services, such as to help customers maintain their health or manage their property, can improve customer retention (through “lock-in”) and provide additional revenue streams for the insurer
- **Exploring Services Along Vertical and Horizontal Value Chain:**
 - ✓ Insurers can expand their scope of offerings along the vertical value chain; for example, distribution of property such as home sensors and cars or car accessories.
 - ✓ Offerings can also be expanded along the horizontal value chain with allied offerings similar to concierge services.
- **Leveraging the Mobile Channel:**
 - ✓ Mobile apps are a very effective and cost-efficient channel through which innovative, value-added services can be provided. They can also have a greater reach than other channels due to their portable nature. This is an important channel for insurers to explore when planning their value-added offerings.
- **Leveraging Data from Value-Added Services:**
 - ✓ As insurers stand to gain a wealth of customer data from the value-added services they provide, they should also plan their strategy on how this data can be used most effectively.
 - ✓ As customers have varied expectations-even in the degree of self-service they prefer-data from value-added services can be leveraged by insurers to tailor and personalize their offerings.

Conclusions

thinking and acting transformatively:

The digital revolution has transformed the way companies interact with customers, creating an environment where marketing, information and technology must work together. Retailers and industry giants have made significant strides in adopting digital platforms to deliver a satisfying customer experience. As mobile and social networks increase in popularity, consumers are relying on smartphones and tablets to research, compare prices and buy products online – anytime, anywhere. Yet, customers expect the same intuitive and streamlined experience from their insurance carriers as they do from their favorite app, search engine or online retailer. Insurance companies must adjust their business models and strategies to remain competitive and take advantage of potential wallet share.

The research gap found in the literature review was that current transformation models for digitalization was too general and lacked practical appliance.

In chapter3: I decided to focus blockchain on insurance because blockchain has not been fully explored yet and in which blockchain could have a relevant impact on several processes and application scenarios. Hence, use cases in this sector could be helpful in identifying advantages and disadvantages of the technology itself. blockchain technology could be gradually inserted in everyday lives. In the meantime, insurance companies are strongly suggested to start investigating it, by acquiring the required competencies, and by creating some prototype solutions. Such prototypes could be useful to evaluate how existing processes would be influenced and to what extent this technology would be accepted by the staff or by customers. What is clear already is that blockchain is bringing a radical transformation to the way we act and think, and we all should be prepared for this change.

blockchain would not be the most suitable technology to use, as existing, well-mastered alternatives would enable the achievement of comparable results . Blockchains will help to manage increasing global complexity by combining security, decentralization and transparency. They will give power back to the customer and will help bring new players into the market. The technical limitations of blockchains must be considered. However, the fact remains that the use cases for which blockchains are paving the way will be deployed regardless, whether with blockchain technology or with an alternative. For the insurance industry, the number of potential use cases goes well beyond those discussed in this report, with varying impacts on the value chain. Certain uses seem easier to implement and appear to offer significant benefits, while others may be riskier, particularly in light of the expected rewards. The scope of possibilities brought about by the blockchain is huge in the insurance industry but will require a period of adaptation and adjustment. The key challenge for all players, irrespective of their industry, will be to identify the use case that will be of most benefit to them and to explore others if their first choice proves unsuccessful.

In chapter 4: In five to ten years, the traditional (and still current) business models of the insurance industry can be expected to have greatly changed. Players' models will either have become IoT focused or will decline. The former will constitute a paradigm shift demanding for a revision of the whole business model and involving complexities on several dimensions. The growing imperative for partnerships, services, and technological complexity is unprecedented as are the vast IT requirements. There is also a strong demand for innovative working methods and organizational flexibility. This will lead to a massive redistribution of market share and surplus not only within the insurance industry but also across the respective ecosystems. To optimally prepare for the IoT challenges ahead and secure the best opportunities for capturing benefits from this, (traditional) insurers are strongly recommended to immediately start anticipating and estimating the expected range of IoT's impact on their business – and to plan the

transformation accordingly. For those who have the foresight, courage, and will to shape the future of the insurance industry in a world of IoT, there are great opportunities for growth and value creation.

In chapter 5 : Incumbent insurers would benefit from drawing up a smart and robust (execution) strategy for expanding their Value-added services offerings. Those who stick with the status quo will find it harder than even to generate new revenue or even preserve their customer base with their current classic “pure insurance” business models especially in light of new competitors). Insurers who act now and fast will be in a strong position (also in emerging connected ecosystems) to tap into new sources of profit for their organizations.

As insurers provide more value-added services, there will be a significant increase in the frequency of interactions between insurers and their customers that can be leveraged to build deeper customer relationships.

By targeting the right value-added services, insurers can lower their claims costs through proactive risk mitigation and they can also achieve competitive differentiation.

By building strong brand engagement, value-added services will also position insurers to counter the threat of entry by big technology players and increased competition.

However, as value-added services are not generally monetized, it will be important to plan an optimal portfolio of services.

Limitations and Further Research

The limitations of this study are stated due to the choice of methodology and focus of the problem researched. The study was focused geographically on Arabic countries; differences in purchasing behavior mean that further studies are required in order to validate the conclusions in other countries.

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ⁱ Insurtech has been defined by Price Waterhouse Coopers as the fintech branch that specifically focuses on insurance. Fintech is the emerging financial technology sector whose name is composed of the words “finance” and “technology”. It uses technological innovation to compete with traditional financial institutions and has mainly focused on servicing mobile payments. Uniformly, insurtech englobes all initiatives aimed at streamlining the insurance value chain by means of technology from actuarial modelling to brokerage (Yoder et al., 2016).