

A Work Project, presented as part of the requirements for the Award of a Master's degree
in Management from the Nova School of Business and Economics.

IMPACT ANALYSIS OF NEW TECHNOLOGIES ON BUSINESS MODEL
IN THE INSURANCE INDUSTRY - SMART DEVICES

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05/06/2023

Abstract

The rapid emergence of new technologies has significantly influenced the insurance industry, driving transformation and innovation in business models. This work project investigates the impact of technologies, such as smart devices and artificial intelligence (AI), on developing insurance offerings and customer experiences. The analysis of the business model canvas reveals that integrating advanced technologies enables insurers to deliver more personalized, flexible, and cost-effective solutions, resulting in improved customer satisfaction and retention. Moreover, the study identifies the importance of data-driven decision-making and proactive risk management as crucial factors in driving the success of new business models in the insurance industry.

Keywords

new technologies, insurance industry, business model,
artificial intelligence, smart devices,
IoT, digital transformation

This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209).

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1. Introduction

The development of new technologies has initialized a transformation across various sectors. It is important to be aware of their impact on businesses and how they influence and reshape various industries, from finance and retail to healthcare and agriculture. The rapid pace of technological innovation, including AI, machine learning, big data, and IoT, presents a unique opportunity to explore how industries adapt to change and leverage these technologies to enhance customer experiences, improve operational efficiency, and drive growth.

New technologies are particularly interesting in the insurance industry due to several factors that make this sector ripe for innovation and transformation. First, the insurance industry relies heavily on complex decision-making processes for underwriting, risk assessment, and claims management. New technologies like AI and machine learning can greatly enhance these processes by automating tasks, analyzing vast amounts of data, and providing accurate, data-driven insights. The insurance industry's complex nature, data-driven decision-making, evolving customer expectations, and need for innovation make adopting new technologies especially interesting and valuable. These technologies have the potential to significantly transform the industry, leading to more personalized, efficient, and customer-centric services. This leads to the research question of how new technologies impact the business model in the insurance industry? By investigating the impact of smart devices, including wearables, IoT-enabled sensors, and telematics, this paper will assess how data-driven insights enable insurers to offer personalized products, enhance risk management, and foster a proactive approach to loss prevention.

Furthermore, it will analyze the role of artificial intelligence in automating complex tasks, streamlining operations, and improving decision-making across various functions. This research will provide a comprehensive analysis of the current state of technology adoption within the insurance industry, identifying key trends, challenges, and opportunities that will

shape this vital sector's future in the digital transformation era. Finally, based on the existing literature and the research question, this study aims to investigate the hypothesis stating that new technologies alter the business model of insurance companies.

The structure of the work paper is organized as follows: following the introduction part, there is a literature review examining the insurance industry and business model canvas concept in this sector. Afterward, the methodology employed for data collection and analysis relevant to the research question is detailed. The subsequent section presents the introduction to new technologies and is followed by the description and analysis of smart devices and artificial intelligence (AI). Both technologies are described and analyzed in terms of their impact on business model in the insurance industry. Lastly, the paper is concluded by summarizing the main findings, discussing their implications, and proposing potential directions for future research.

2. Literature review

2.1. An overview of the Insurance Industry: Key Concepts and Dynamics

The insurance industry is a complex sector that provides individuals, businesses, and organizations with financial protection against potential risks and losses. Insurance is *the exchange of an uncertain loss of unknown magnitude for a small and known loss (the premium)*. (Zweifel, Eisen, and Eckles 2021) Its fundamental role is managing risk. Insurers offer various policies such as home insurance, life insurance, health insurance, auto insurance, and many more to protect against unpredictable events, such as accidents, illnesses, and natural disasters. Companies use various techniques to assess and manage risks, including actuarial science, risk pooling, and diversification.

The traditional business model of an insurance company revolves around assessing and managing risks to provide financial protection to individuals and businesses. Insurance providers collect premiums from policyholders and pool these funds together to cover potential

losses. They rely on skilled underwriters who use actuarial science, historical data, and risk analysis to determine the likelihood of various events occurring and calculate the appropriate premium rates. When a policyholder experiences a covered loss, the insurance company pays a claim according to the policy's terms. The goal of an insurance company is to maintain a delicate balance between premiums collected and claims paid while investing surplus funds to generate additional revenue. This business model requires a substantial focus on managing administrative costs, handling claims efficiently, and maintaining customer satisfaction to ensure long-term profitability and growth.

The fact that the insurance industry faced various challenges in 2021 due to the COVID-19 pandemic has made the sector adapt to the new reality of remote working and digital customer engagement while managing increased claims and financial risks. Despite these challenges, the global insurance market remained stable and generated revenues. Moreover, the pandemic and technological advancements have accelerated the emergence of innovative business models within the insurance industry. As the world becomes more interconnected and digital, consumers seek personalized, flexible, and convenient insurance products that align with their evolving needs and lifestyles. With these emerging business models reshaping the insurance landscape, it is important to understand the market dynamics, trends, and the potential impact of these innovations. The market size in 2021 was estimated at over \$6 trillion, with the non-life insurance segment being the industry's largest component, accounting for over half of the global market. The pandemic created new opportunities for insurers in some areas, such as health insurance, where policy demand increased due to concerns about COVID-19. However, it also caused disruptions in other industry segments, such as travel insurance, which experienced a significant decline in demand. Technology played a crucial role in the insurance industry in 2021, as insurers increasingly relied on digital platforms and tools to offer their products and services to customers. Insurtech, a portmanteau of "insurance" and "technology",

represents the wave of digital innovation that's disrupting the traditionally conservative insurance industry. The rise of insurtechs has been driven by a combination of factors including advancements in technology, changing customer expectations, and the desire for more efficient and personalized insurance services. Insurtech companies continued to disrupt the traditional insurance market, introducing new business models and innovative solutions, increasingly adopting technologies like artificial intelligence, the internet of things, machine learning, and data analytics. (Statista 2022) Insurtechs are capitalizing on the inefficiencies of traditional insurance companies as, by leveraging technology, they can automate and streamline processes, reducing overhead costs and enabling more competitive pricing.

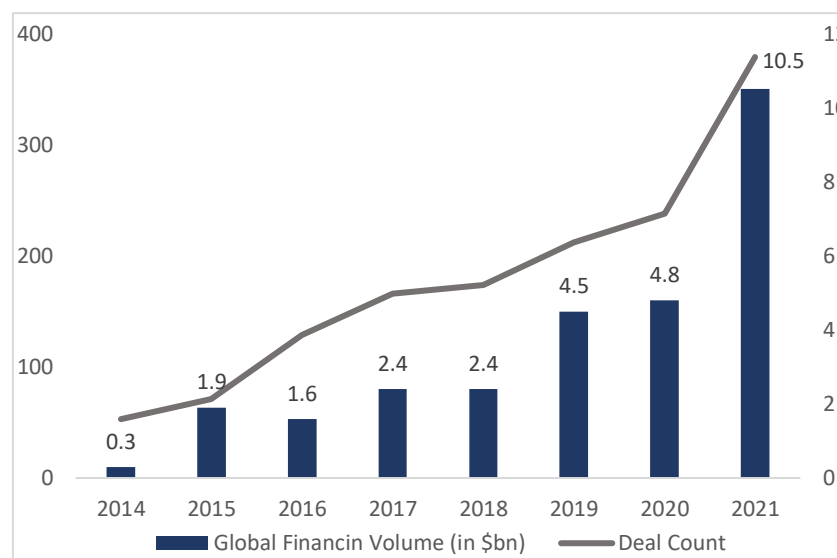


Figure 1. 2014-2021 Insurtech financing activity (Ostertag et al. 2022)

The financing activity of insurtechs has seen a significant upswing between 2014 and 2021, indicating a surge in investor interest and confidence in this sector. In 2014, insurtechs secured 53 deals, amounting to a total of \$0.3 billion. However, by 2021, the number of deals skyrocketed to 379, and the total financing increased dramatically to \$10.5 billion. This represents a roughly 7-fold increase in the number of deals and a more than 30-fold increase in funding over this period. (Figure. 1)

Another trend that is transforming the insurance industry is open insurance, which is a modern business approach. It refers to sharing data and services through open APIs and other interfaces across different organizations and industries to create new value propositions, generate revenue streams, and deepen customer relationships thanks to more personalized and innovative insurance products and services. Overall, open insurance is a significant trend reshaping the insurance industry and offers new opportunities for innovation and growth. By embracing this approach, insurers can become more customer-centric, agile, and efficient and better position themselves to succeed in a rapidly changing market. (Gasc 2020)

The insurance industry is expected to continue to grow, driven by the increasing adoption of digital technologies and the expansion of emerging markets. However, the sector also faces significant challenges related to changing customer needs and expectations, evolving regulatory environments, and new risks associated with global trends. (Statista 2022)

2.2. Insurance Industry Business Model Canvas: A Strategic Framework

The term “Business model” is commonly used while analyzing how a company is operating. One of the first definitions provided was formed by Timmers in 1998. He stated that Business Model is an architecture for the product, service, and information flows, including a description of the various business actors and their roles, A description of the potential benefits for the various business actors, and a description of the sources of revenue. However, Timers pointed out that a business model definition alone is not sufficient to describe a company's and external actors' aims (W. Wirtz 2020). In the next years, the definition evolved as more authors introduced their models and explanations (ex. Business model definition by Wirtz (2000), Business model approach by Hedman and Kalling (2002)). Nowadays, one of the most popular models used in creating business model is Business Model Canvas by Alexander Osterwalder and Yves Pigneur. They define a business model as the rationale of how an organization

creates, delivers, and capture value. The BMC model consists of 9 building blocks describing how the company plans to generate cashflows. (Osterwalder and Pigneur 2010)

The business model canvas is a universal tool that can be used in a vast spectrum of market segments. It is crucial to note that every building block will vary significantly between different industries. Yet, it is likely that within the given industry, BCM for each organization will be quite similar. Therefore, to analyze the impact of new technologies (AI and smart devices) on the BCM in the insurance industry, it is crucial to explore how each building block of the BCM model is designed.

Customer segments

In the insurance industry, segmentation is a necessary process that involves various criteria and attributes. This industry's most significant segmentation types are value-based, socio-demographic, and behavioral patterns. Value-based segmentation groups customers based on their revenue or profitability, making it an essential tool for identifying the most valuable customers and tracking changes in their value over time. It also helps develop differentiated service delivery strategies and optimize marketing resource allocation. Socio-demographic segmentation uses information such as age, income, and education to identify different customer groups. Behavioral segmentation involves analyzing customer behavior patterns using data from the organization's data warehouse or data marts, and the segments are identified using appropriate clustering models. The insurance industry typically relied on basic demographic information to segment its customers. While this approach may have been sufficient in less competitive markets, it can lead to oversimplifications and stereotypes. This traditional segmentation model is no longer effective in the modern era of customer-centric and highly competitive insurance businesses. Instead, companies must adopt more sophisticated approaches that consider a more comprehensive range of factors, such as customer behavior, preferences, and needs, to understand and cater to their customers honestly.

Value proposition

Throughout history, insurers have viewed their primary role as aiding customers after a loss. That was a traditional approach to the value proposition in the insurance industry. Nowadays, the value proposition of insurance companies must also prioritize reducing the likelihood of loss for their customers. Preventing losses is preferable for businesses than relying solely on compensation for damages after a loss has occurred. By taking a proactive approach, insurers can assist customers in identifying and mitigating potential risks, such as providing safety inspections, loss prevention advice, and employee training programs. This approach can result in a more sustainable business model, benefiting the insurance company and the customer. In addition, insurers can leverage technology and data analytics to identify emerging risks and offer timely advice to customers, such as preparing for natural disasters or defending against cyber threats. Ultimately, insurers can build customer loyalty and trust by prioritizing risk prevention and mitigation, making their business model more robust (Manchester 2020).

Channels

Insurance product sales have traditionally been carried out by insurers through intermediaries such as agents and brokers, whether company-employed or independent. However, in recent years, alternative distribution channels such as call centers, bancassurance, internet, and mobile have become increasingly popular and have gained significant momentum (Bhattad, 2012). Insurers use several channels. Traditionally, they cooperated with brokers and agents that acted as intermediaries between the insurance company and the customer, helping customers choose the right policies and handling the paperwork. Next, many insurance companies operate call centers that customers can contact to get information about insurance products, make claims, or purchase policies. Call centers are often staffed with trained professionals who can assist customers with their insurance needs. Another channel is bancassurance, which enables the selling of products through banks. In practice, banks partner with insurance companies to offer

insurance products to their customers, often as an add-on service to their banking products. Currently, the Internet is probably the most popular distribution channel. It can be stated that common access to the internet has revolutionized the insurance industry, as it allows customers to compare prices and purchase policies online. Many insurance companies offer websites and mobile apps where customers can get quotes, purchase policies, and make claims. Lastly, probably the most recent distribution channel is the mobile channel. It refers to insurance products and services offered through mobile devices such as smartphones and tablets. Mobile insurance products are often sold through mobile apps or websites, making it easy for customers to purchase policies and make claims.

Customer relationships

The customer relationship block shows the relationships between customers and a company. Those relationships range from personal to automated and may have several motivations, such as customer acquisition, customer retention, boosting sales, etc. In addition, customer relationships have a significant impact on the customer experience.

Revenue streams

Like many other businesses, insurance companies generate revenues primarily by selling products to customers. In the case of insurance companies, they sell insurance policies to customers and receive payment in the form of premiums. The primary way that an insurance company generates profits is by ensuring that the premiums they receive are greater than the claims made against the policies. This is referred to as underwriting profit. Apart from this, insurance companies also earn investment income by investing in the premiums they receive. (Mehta 2022).

- Underwriting: Insurance companies offer insurance policies to individual and corporate clients to obtain premiums. The policies are contracts in which the insurer assumes

financial responsibility for specified loss events in exchange for premium payments from the policyholder. The insurer analyzes past data and applies statistical models to predict potential future loss events, allowing them to calculate premiums. In addition, they utilize actuaries to estimate the likelihood and cost of future claims. In addition, insurance companies strive to maintain profitability by ensuring that the total amount paid out in claims is less than the total premiums received.

- Investing premiums: Insurance companies typically invest the premiums they receive from their policyholders in financial markets to generate additional income. Rather than separately investing premiums from individual policies, insurers combine them to form a portfolio. This enables them to offset the impact of significant claims from some policyholders with the premiums collected from others in the portfolio, thereby minimizing overall risk.

Key activities

Insurance companies must engage in various activities to run their business successfully. The key activities are:

- Marketing: Advertising and promoting insurance products through agents, brokers, and company websites.
- Underwriting: Assessing potential policyholders' risk level to determine the appropriate pricing.
- Administration: Managing administrative tasks such as record-keeping, premium collection, customer service, and office management.
- Investments: Investing premiums in the capital market to provide security to policyholders.
- Reinsurance: Transferring risk to another insurance company through reinsurance contracts.

- Legal and Regulatory Issues: Handling legal matters such as drafting contracts, interpreting provisions, defending the company in lawsuits, and communicating with regulators.
- Claims adjustment: Paying out claims to insured customers who have suffered losses.

Key resources

To fulfill its role effectively, the insurance company requires a set of resources that enables it to manage risks, provide quality customer service, develop innovative products, and generate sustainable financial returns. These resources can be broadly categorized into financial, human, technological, and data resources, each of which plays a critical role in supporting the core functions of insurance companies.

- Financial resources: Insurance companies require capital to underwrite policies, pay claims, and invest in financial markets.
- Human resources: Skilled employees are needed to perform various tasks such as underwriting, claims adjustment, marketing, and administration.
- Technology resources: Insurance companies need advanced systems to manage data, automate processes, and improve customer experience.
- Data and analytics resources: Insurance companies require data and analytics resources to predict risks, set premiums, and monitor performance.
- Physical resources: Insurance companies require office spaces, equipment, and infrastructure to support their operations.

Key partnerships

In the insurance industry, key partnerships are formed with various entities, such as brokers, agents, etc. Brokers and agents act as intermediaries, connecting insurers with customers and helping to grow their business. In turn, brokers and agents receive a commission from the insurer for policies sold. Reinsurers provide insurance coverage to insurers, reducing their risk

exposure and allowing them to underwrite more significant policies. Insurance companies also partner with other service providers, such as law firms, technology companies, and data analytics firms, to enhance their capabilities and improve their overall efficiency operations. These partnerships allow insurers to access specialized expertise, improve risk management, and better serve their customers. Recently, the insurance industry has seen increasing partnerships with companies offering various solutions based on AI and other new technologies. These partnerships have allowed insurers to improve their underwriting, claims processing, and customer service through automation, data collection, and analysis. For example, insurers are partnering with companies that offer AI-powered chatbots to provide 24/7 customer service and with telematics providers to improve risk assessment for auto insurance.

Cost structure

The cost structure of insurance companies is intricate and continuously evolving. According to McKinsey's report "Evolving insurance cost structures," insurance companies' cost structure comprises four main categories: product development, marketing, sales support; operations; other support functions; and IT. In 2012, product development, marketing, and sales support accounted for 19% of costs, operations for 44%, other support functions for 20%, and IT for 17%. In 2017, product development, marketing, and sales support accounted for 25% of costs, operations for 20%, other support functions for 26%, and IT for 29% (Freysoldt et al. 2018). The report suggests that the cost structure will continue to change, mainly due to the increasing use of new technologies.

3. Methodology

This research paper will rely on secondary data to examine the impact of AI and smart devices on business model within the insurance industry. Several vital aspects condition the rationale

for using secondary data. Firstly, it provides access to a diverse range of pre-existing data sources, including industry reports, academic literature, and case studies, which provide a comprehensive understanding of the subject. This allows for a thorough analysis of historical trends, existing business models, and technological advancements.

Secondly, focusing on secondary data can ensure the credibility and reliability of the findings. As the data has been previously gathered, analyzed, and published by reputable sources, the research can benefit from the expertise and validation of these sources. Additionally, using secondary data involves the aggregation of information from multiple sources, which can result in a more holistic perspective on the subject.

Lastly, using secondary data can result in a more efficient research process. Given the predetermined time to complete the Work Project, these inputs allow to focus on analyzing and interpreting the data, which allows for a more streamlined and focused approach to solving the research question.

4. New technologies

Integrating new technologies has opened many possibilities for innovation and transformation across various industries. As technologies continue to evolve and mature, they are increasingly being used in conjunction to improve operational efficiency, customer experience, and decision-making processes. The potential benefits of these technologies are numerous, ranging from predictive maintenance and asset optimization to personalized healthcare and smart cities. One industry that has been resistant to digitalization for many years and is now also making its entry into the world of new technologies is the insurance industry. Modern instruments such as artificial intelligence (AI) and the internet of things (IoT), or blockchain and big data analytics, have the potential to revolutionize various aspects of the insurance business model. They are transforming how policies are sold and underwritten, how claims are processed and analyzed, and how insurers manage risk and combat fraud. Previously known models are

starting to give way to new concepts such as connected insurance, usage-based premiums, or smart underwriting (Vartak and Jain 2019). These technologies offer numerous benefits, including increased efficiency, more accurate risk assessment, cost reductions, and better-tailored products. However, these developments also present several challenges and concerns that must be addressed. First, data privacy and cybersecurity are critical, as the increasing use of connected devices and data sharing exposes customers and insurers to potential data breaches and unauthorized access. Furthermore, ethical considerations, such as the potential for discriminatory practices arising from using personal data in pricing and underwriting, must be carefully evaluated. As the insurance industry continues to embrace and adapt to these technologies, it is essential to strike a balance between realizing their potential and addressing ethical concerns and associated risks.

4.1. Smart devices

The Internet of Things (IoT) is the network of equipment and devices connected to the internet, equipped with software capable of exchanging data with other related objects (Atzori, Iera, and Morabito Giacomo 2017). The main objectives of those devices are the collection of data and information, the issue of commands, and the monitoring of activities (Nicoletti, n.d.). Most objects with on and off switches may be part of the IoT. These objects are smart mobiles, smartwatches, medical systems, smart security systems, and many more. IoT provides its users - individuals, organizations, and businesses – with entirely new capabilities as it can transfer signals, text, software, and other data without or with limited human intervention. The development of IoT gained momentum in the 2010s for several reasons, with two being significantly important. Firstly, access to broadband internet became much more accessible, both technologically and financially, which has led to the drastic expansion of WEB users. Secondly, the costs of production of hardware and software have decreased (The sales number of smartphones containing three or more sensors have increased from 0.5 billion to 1 billion

for five years since 2010, and the unit price of semiconductor sensors has fallen from 0.7 to 0.4 dollars (Lineback 2016)) which resulted in more and more people using smartphones, smartwatches, and other smart devices daily. It is estimated that in 2010 people owned 12.5 billion networked devices (Behm, Deetjen, Kanyiar, et al. 2019). In 2020, that number doubled, according to Gartner (Van Der Meulen 2017), and is expected to double again by 2025 (Behm, Deetjen, Kanyiar, et al. 2019). It can be expected that in 2025 each person, on average will own six smart devices, while in 2015, that number was only 3,5. (Figure 2)

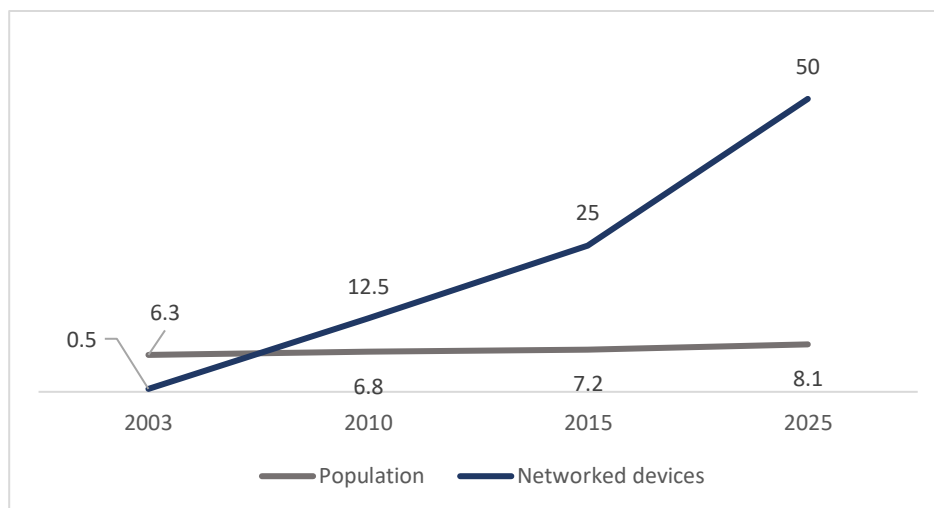


Figure 2. The increase in the number of smart devices compared to the population growth (in billions) (Behm, Deetjen, Kaniyar, et al. 2019)

All those devices generate and transfer an enormous volume of data that is often not accessible to their providers or third parties. Every interaction with these devices, be it a search query, a location check-in, or a health status update, generates data points that are stored, analyzed, and used to gain insights. Businesses can better leverage this wealth of information to understand customer behaviors, preferences, and trends. Additionally, these data can help identify market trends and opportunities, thus enabling businesses to strategize and adapt to changing market dynamics more effectively. This, in turn, can significantly improve their

decision-making processes. Finally, it is believed that IoT will dramatically impact the future, affecting individuals' personal and professional lives and how business is done.

4.1.1. IoT Architecture: Design Principles and Building Blocks

IoT is not simply a device or web application. It is a complex system of components called layers, which enables the administrator to collect, store and analyze the data to use it in the process. IoT World Forum provides a 7-layer model of the IoT system that shows how it processes the data. (Figure 3)

Level	Abstract layer
7	Collaboration and processes (involving people and business process)
6	Application (reporting, analytics, and control)
5	Data abstraction (aggregation and access)
4	Data accumulation (storage)
3	Edge computing (data element analysis and transformation)
2	Connectivity (communication and processing units)
1	Physical devices and controllers (the “things” in IoT)

Figure 3. 7-layer model of IoT system (E.Porter and E. Heppelman 2014)

On the first layer are physical devices and controllers such as smartwatches, smart home devices, etc. Using sensors, those devices collect the data and send them further to the computers that analyze and transform it. After preliminary treatment, data is transferred to the data center, where statistical operators and abstraction are applied. Next, dedicated applications are used to analyze and present the data, which in the end, is used by people. In that process, each layer of the reference model corresponds to procedures and simplifies data flow as interactions between layers; an upper layer sends requests and a lower layer serves services to the upper. (Pedro and Lev, n.d.)

4.1.2. Smart Devices: Functions and Capabilities

As mentioned before, IoT refers to a complex hardware and software system. It provides its administrator with new capabilities that may be used in business. In this paper, the focus will be on smart devices, which according to the model presented by the IoT World Forum, are a start of every IoT system. A smart device is a wired or wireless context-aware electronic device capable of performing autonomous computing and connecting to other devices for data exchange (Silverio 2022). To consider a device smart, it must have three features. Firstly, a device must be aware of the context. It has gathered information about its environment at any given time and adapted behaviors accordingly (Silverio 2022). Secondly, a smart device, or a set of smart devices, must be able to compute autonomously without any direct command from the user. Lastly, a smart device must be able to connect to a network. Network connectivity, whether wired or wireless, is a crucial feature that enables a device to be a part of the IoT (Silverio 2022). Smartwatches, smartphones, or virtual assistants are the most apparent examples of smart devices. However, the range of devices that can be called smart is much more extensive. Smart devices are present in numerous industries, such as insurance, medicine, logistics, manufacturing, and automotive, to name a few. They are changing how the companies operate effectively changing their business model, as they offer new functionalities, significant amounts of valuable data, high reliability, and many more, creating new competitive opportunities. Smart-connected products provide unique capabilities that may be divided into four main groups - monitoring, control, optimization, and autonomy. (Figure 4) Each build on the preceding one; to have control capability, for example, a product must have monitoring capability. (E.Porter and E. Heppelman 2014)

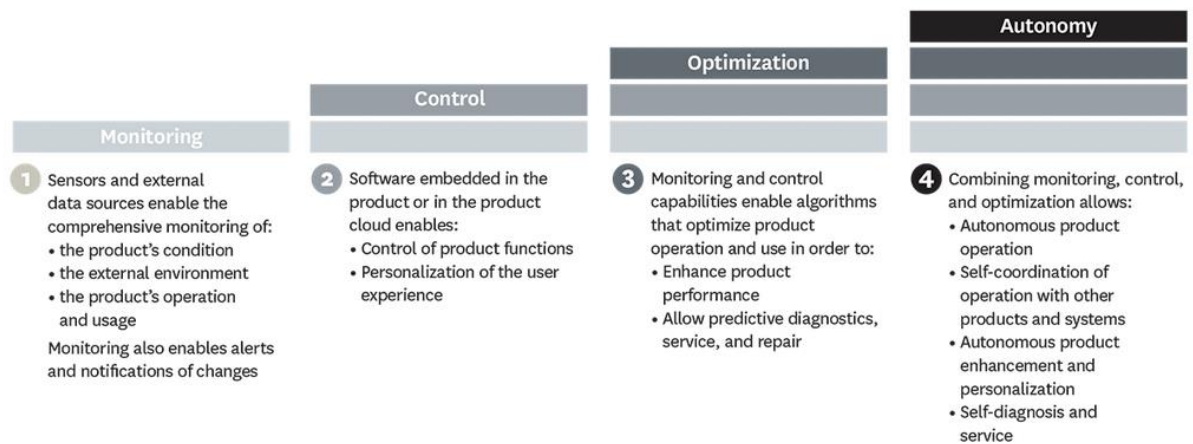


Figure 4. Capabilities of Smart Devices (E.Porter and E. Heppelman 2014)

Monitoring

Monitoring refers to the ability of a smart device to track its internal condition and operation as well as the external environment using sensors and other (possibly external) data sources. It enables users to notice specific changes in the environment or to track the performance of a process or a device. It has significant implications, as depending on the type of the device, the context, or the purpose of it being used, the user may use that data to make improvements or introduce alternations. Moreover, in some cases, the ability of a device to monitor will be at the core of the value proposition. An example of such a device would be Abbotts FreeStyle Libre, a sensor-based glucose monitoring system. After the application of a small, rounded sensor on a patient's upper arm, it starts to read the glucose level automatically every 1 minute. By the dedicated smartphone application, a patient may check the current glucose level, an 8-hour history of glucose level, and its trend. Finally, the application allows a patient to set alarms that would send information about glucose levels being too high or too low. It also allows sending data to healthcare professionals if needed.

Control

Control is an amplification of an ability of a smart device to monitor certain factors. A device that can monitor may also have the ability to control another device by command or algorithms that are built in or reside in the cloud. A mechanism would be that a smart device would monitor some aspects. If a given criterion is met, a smart device will perform an action, possibly giving a command to another smart device according to an algorithm. An example of such a device and its operation would be smart thermostats. A user would set a desired temperature in the house using a smartphone, and then a device would monitor the temperature and react if the temperature is too high or too low. It would send the signal to the central heating unit with information that it either needs to start or stop working.

Optimization

Smart devices are collecting enormous amounts of data. Often, such data was not possible to be collected in the past, thus, the introduction of smart devices created a space for optimization for many companies. A fine example of optimization using smart devices may be seen in the energy sector on wind farms. The main sensors used for the control on a wind farm include temperature sensors for detecting the heating and cooling of the system, airflow sensors, speed sensors, level sensors, position sensors, pressure sensors, and vibration sensors. One of the main issues in the wind farm is that in cold weather, when the blades are covered in ice, the productivity of a wind turbine may be reduced by 20%, and the overall reliability of a farm is harmed. One of the ways to deal with that problem is to introduce a smart de-icing system that would detect the ice on the blades using the sensors and then trigger the automated de-icing process by, for example, shaking off the ice through acceleration and deceleration of rotating blades. Data about the icing on the wind turbine blades is rather difficult to collect without using the sensors. Wind farms are mostly sited in remote areas where a large quantity

of wind could be collected, making it difficult to access by humans and increasing the overall maintenance costs. (Lanre Adekambi 2021)

Autonomy

Monitoring, Control, and Optimization abilities enable the smart devices to be autonomous. For example, sophisticated smart products may learn about their environment, self-diagnose their service needs, and adapt to user preferences. (E.Porter and E. Heppelman 2014)

4.1.3. Impact of Smart Devices on Business Model in the Insurance Industry

The rapid proliferation of smart devices in recent years has catalyzed transformation across numerous industries. One such sector profoundly affected by this digital revolution is the insurance industry. Integrating advanced technology into insurance practices has significantly altered traditional business models, paving the way for innovation and increased competitiveness. This section aims to analyze the impact of smart devices on the business model canvas of the insurance industry, focusing on how these technological advancements are reshaping each building block and driving the evolution of insurance offerings.

Customer Segments

A vast amount of data collected by smart devices allows insurance companies to develop more sophisticated customer segmentation models that go beyond traditional approaches. Smart devices provide insurers with data not accessible in the past - about their customers' lifestyles, habits, and preferences. It enables companies to build more comprehensive customer profiles and identify unique segments that were previously unrecognized and not addressed. Data collected by smart devices regarding customers' driving habits, health, fitness routines, etc., may now be analyzed and used in the decision-making process as it provides valuable insights. It becomes possible for insurers to create segments based on actual behavior patterns rather than relying only on demographic details.

Moreover, data collected by smart devices may enable insurers to use dynamic and micro-segmentation. The dynamic approach allows companies to quickly identify emerging trends, shifts in customer preferences, and changes in risk profiles based on the changes in behavioral patterns and continuously streamed and analyzed data. Micro-segmentation allows targeting micro-segments with highly customized products and services where personalization and differentiation is the most important factor when competing with other insurance providers. Lastly, by leveraging data from smart devices to create targeted, personalized offerings, insurance companies may improve customer satisfaction and loyalty, leading to higher retention rates which are extremely important. Insurance companies spend up to 7 times more to acquire a new customer than to retain one. Customer retention is far more cost-effective than customer acquisition. Therefore, it becomes imperative that insurers focus more on reducing customer churn and boosting retention. (McGranahan, Catlin, and Ray 2013).

Value Proposition

In the case of traditional insurers' business model, the core value of insurance products is to cover a generalized representation of the likely risk rather than the specific risk the policyholder is facing (Manchester 2020). Nowadays, customer expects that insurance will be tailored to their specific needs, meaning that insurers must completely rethink and redesign their value proposition. Smart devices have the potential to revolutionize the value proposition of the insurance industry by enabling a proactive approach to risk prevention and mitigation. By leveraging data collected from these devices, insurers can provide their customers with personalized solutions, timely advice, and real-time monitoring services. Smart devices like wearables and telematics enable insurance companies to collect data about their customers' behaviors, habits, and preferences. This data is later analyzed and used to create customized insurance policies that are adjusted to each customer's specific needs, making the value proposition more relevant. Secondly, they allow insurers to monitor and assess risks in real

time. For example, smart home security systems can detect potential threats like break-ins or fires (case study 1. Company: Metromile), while telematics devices installed in a car can monitor driving habits and alert policyholders to unsafe behaviors. (case study 2. Company: Hippo) Using that data, insurers may help customers proactively mitigate risks and avoid potential losses.

Furthermore, the data being constantly collected by smart devices allows insurance companies to implement dynamic pricing models based on actual risk levels. By analyzing behavioral patterns and risk factors, such as driving habits, insurers can adjust premiums and discounts in real-time, rewarding customers for lower-risk behaviors and encouraging safer practices. Smart devices can expedite and streamline the claims process by providing accurate, real-time data on the circumstances surrounding a loss. This data enables insurers to make faster, more informed decisions, reducing the time and costs associated with traditional claims processing. By harnessing the power of data analytics, insurance companies can identify trends and patterns, anticipate future risks, and develop targeted strategies to address emerging threats. For example, insurers can use weather data and historical loss information to predict the likelihood of natural disasters, enabling them to advise customers on risk mitigation measures. Lastly, integrating smart devices fosters a more interactive relationship between insurers and their customers. Insurers can enhance customer engagement, trust, and loyalty by providing timely advice, personalized solutions, and value-added services, ultimately contributing to a more robust business model.

Channels

Traditional intermediary-driven model is evolving and accommodating new technologies. Smart devices created new distribution channels for insurers and altered how customers interact with insurers and how insurance products are distributed. Firstly, Smart devices have facilitated the growth of Direct-to-Consumer (D2C) channels, which allow customers to access insurance

products and services directly through their smartphones, tablets, or computers. In addition, it eliminates the need for intermediaries making the purchasing process easier and allowing customers to compare policies, receive personalized quotes, and make more informed decisions, enhancing their overall experience and satisfaction.

Secondly, insurers have developed mobile applications that allow customers to manage their policies in real-time. These applications provide a convenient and efficient way for customers to interact with their insurance providers and quickly access services, significantly enhancing the overall customer experience. A good example of such an application is Oscar Health Mobile Application developed by Oscar Health Inc. It is a user-friendly app designed to give customers easy access to their health insurance information and services. The app allows users to access their digital ID cards, eliminating the need for physical cards and ensuring that important insurance information is always readily available. It enables users to find in-network doctors, specialists, and healthcare facilities based on location, ratings, and availability. Moreover, users can view and track their claims, access billing information, and make payments directly through the app, streamlining the insurance management process. Interestingly, the app offers a built-in step counter and activity tracking, allowing users to monitor their daily physical activities and participate in wellness programs that may provide incentives for staying active. All in all, integrating smart devices in the insurance distribution landscape has led to adopting an omnichannel approach, where insurers strive to provide a consistent and seamless experience across multiple touchpoints. This approach ensures that customers can access services and interact with their insurers through their preferred channels, whether online, via mobile apps, or in person with an agent. (Kaesler et al. 2020)

Customer Relationships

Smart devices facilitate better communication between insurers and their customers through mobile applications that enable real-time updates, notifications, and support. Customers may

access their insurance information, make payments, and submit claims through smartphone apps or other digital platforms, leading to a better customer experience. It is expected that smart devices will help to enhance loyalty and engagement, as personalized services and instant access to information cater to customers' unique needs and preferences, fostering a sense of trust and connection with their insurance providers. While smart devices play a crucial role in reshaping customer relationships, it is important to note that other emerging technologies, such as artificial intelligence (AI), will likely have an even greater impact on this building block in the insurance industry.

Revenue Streams

The insurance industry relies on two main sources of income: underwriting profit and investment income. Smart devices are likely to impact both income sources positively. Insurance companies can refine their underwriting processes using the data collected by smart devices (Feurstein and Karmann 2017). Analysis of that data provide insight into consumer behavior thus, it allows to assess risk levels and price policies better and more accurately, using usage-based or demand-adjusted pricing (Behm, Deetjen, Kanyiar, et al. 2019). As a result, insurers can increase their underwriting profit by minimizing claims payouts while maintaining competitive premium rates. Root Insurance is an example of insurtech that uses smart devices to enhance its revenue stream. It is a US-based auto insurance provider that leverages telematics data from customers' smartphones to assess driving behavior.

The Root can offer personalized rates and incentivize safer driving by pricing policies based on driving habits. Moreover, smart devices enable Insurers to implement dynamic pricing models which adjust premiums based on actual risk levels. An example of a company that is using dynamic pricing is Metromile. It is a US-based auto insurance provider that uses telematics devices to offer pay-per-mile insurance. Customers are charged based on their actual mileage, which encourages them to drive less and reduce their risk exposure, following the

logic that the less a customer drives, the lower probability of an accident. Such an approach is beneficial both for the insurer and customer as, on the one side, there is a lower probability of payout, and on the other, customers that use their car less - pay less. Using smart devices can also indirectly impact the investment income of insurance companies. Furthermore, as smart devices enable insurers to reduce risk exposure and improve underwriting profitability, they may generate more stable and predictable cash flows. This, in turn, can allow insurers to adopt more strategic, long-term investment strategies that can potentially yield higher returns.

Key Activities

Smart devices are poised to significantly impact most key activities of insurance companies, including marketing, underwriting, administration, investments, reinsurance, legal and regulatory issues, and claims adjustment. Marketing and underwriting are expected to be the most affected areas. The data collected from smart devices enables insurers to create targeted marketing campaigns and better understand customer needs, leading to improved customer acquisition and retention. In underwriting, the real-time data generated by smart devices help insurers assess risk levels more accurately and price policies, ultimately reducing claims payouts and possibly improving overall profitability.

Key Resources

Smart devices have a great potential to become a key resource for insurance companies and alter how other resources are used. Considering the critical resources in the insurance industry, it may be stated that because of improved underwriting, an insurer may optimize their financial resources, reduce claims payouts, and potentially generate higher returns on their investments. Regarding human resources, smart devices can automate routine tasks and processes, potentially allowing employees to focus on more complex and value-added activities. This shift

can lead to better utilization of human resources and increased organizational productivity. As smart devices enable more efficient and remote communication between insurance companies and their customers, the need for physical resources such as office spaces and equipment might be reduced. This could lead to cost savings and more flexible working arrangements for employees.

Most importantly, smart devices and the data they collect are becoming a key resource in insurance. Some companies, for example, previously mentioned Metromile, place the smart telematics device Pulse in their business model's center. Without Pulse, Metromile could not offer flexible car insurance plans as it could not dynamically assess the client's risk profile based on the data the device is collecting. (case study 1. Company: Metromile) Therefore, smart devices and data employed by the insurer will most likely become a distinct category in the key resources building block, as they significantly influence the insurer's whole business model.

Key Partnerships

In the traditional insurers business model, the key partnership-building block consists mostly of brokers, agents, and other intermediaries whose main task is connecting with clients and selling insurers' products. Smart devices are set to transform the key partnerships building block in the insurance industry by introducing new collaborations and enhancing existing relationships. Firstly, as smart devices become more prevalent, insurance companies are more eager to partner with technology firms specializing in IoT, AI, and machine learning. These collaborations enable insurers to leverage the latest technological advancements and integrate smart devices into their operations, leading to more accurate risk assessments, pricing, and personalized services. Secondly, insurers will look to partner with companies specializing in data analytics. Smart devices generate vast amounts of real-time data that, as mentioned before, may significantly impact the whole business model. However, pure data without

adequate interpretation may turn out to be useless. Therefore, as insurers may not have analytical capabilities, they will form partnerships with data analytics firms to efficiently process, analyze, and utilize this data to improve their underwriting, claims processing, and customer service.

Moreover, insurers may decide to form partnerships within the ecosystem, for example, with smart home providers or connected car manufacturers, to offer tailored insurance products and services, creating new revenue streams and strengthening customer relationships. Lastly, as smart devices enable customers to access insurance services directly through digital platforms, the role of agents and brokers will most likely change. Broker's role will transition to a more advisory role, focusing on value-added services and personalized customer interactions. (Fourie and Hoosain n.d.)

Cost Structure

Smart devices can significantly change insurance companies' cost structure building block by influencing various cost drivers and creating new efficiencies. Firstly, a more accurate risk assessment that is enabled by analysis of data collected by smart devices will most likely lead to a reduction in claims payouts and lower overall costs associated with underwriting and risk management making overall operational costs lower (Behm, Deetjen, Kanyiar, et al. 2019). What's more, smart devices enable digital communication and remote services. Therefore, insurers will require fewer physical resources such as office spaces, equipment, and infrastructure. This can lead to reduced overhead costs and increased operational efficiency. Integrating smart devices with advanced technology systems can automate routine tasks and processes, streamlining operations and reducing labor costs. Lastly, smart devices allow insurance companies to tailor products and services to individual customers, which may result in more efficient use of resources, better customer retention, and reduced costs associated with customer acquisition, decreasing marketing costs. (Burtwell, Biddiss, and Ross 2020)

According to the report by McKinsey from 2018, costs of sale support are expected to decrease by 14%, operations by 38%, and marketing by 6%, while the overall cost of IT will increase by 9% (Freysoldt et al., n.d.). Those changes are mostly due to the automation of sales support, reduced training, and an increase in self-service. (Freysoldt et al., n.d.)

4.1.4. Conclusion: Assessment of the Impact of Smart Devices on Business

Model in the Insurance Industry

It may be stated that smart devices will most likely lead to a shift in the insurance industry. The analysis of the impact of smart devices on each building block of the business model canvas in the insurance industry indicates that insurance companies are already changing or will have to change their business principles to remain competitive. According to Michael C. Jensen, the firm's objective function is to maximize total long-term firm market value considering all the stakeholders (Jensen 2002). It can be stated that all the alternations that are introduced to the building blocks of insurers business model because of the implementation of smart devices are reflected in this theory. Ultimately, they aim to reduce costs while offering more attractive terms for using insurance products for customers, in theory, maximizing the utility of all parties involved in this transaction. This situation may occur due to three fundamental changes enabled using smart devices. Insurers may implement a more data-driven, customer-centric, and dynamic approach. The wealth of real-time data generated from wearables, smart homes, connected cars, and other devices provides insurers with priceless insights into customer behavior and habits helping to better create and assess their risk profiles. This approach allows companies to make informed decisions about underwriting, pricing, and risk assessment, leading to more accurate and efficient processes. That, in turn, will most likely have a significant impact on their financial performance in the future.

Moreover, insurance companies have leveraged the data from smart devices to personalize their products and services, tailoring insurance policies to individual customers'

specific needs, which results in more competitive pricing. Moreover, real-time monitoring of smart home systems, connected cars, and wearables can provide early warnings of potential hazards or irregularities, allowing insurers to take preventive measures or identify fraudulent claims. This not only helps to minimize losses for insurance companies but also maintains the industry's integrity. The actual qualitative and quantitative assessment of the impact of smart devices on business model in insurance industry is hardly possible due to the lack of available data from traditional insurers, and a fact that most insurtechs are still in early stages of development. Yet, it can be stated that insurance market is in the process of, or on the eve of, fundamental changes.

5. Disruptors

Data privacy and security matters are becoming increasingly important as new technologies continue to reshape the insurance industry. Intelligent devices are generating an unprecedented amount of data that insurance businesses can leverage for more accurate risk assessment, personalized premiums, and improved customer service. However, data privacy concerns represent a significant limiting factor in developing these new insurance models.

Firstly, collecting, storing, and using personal data from smart devices can raise serious privacy concerns among consumers. Personal data derived from smart devices can be compassionate, often relating to health, location, and personal habits. Consumers may not be comfortable with their insurance company having access to such detailed personal information, fearing it could be misused or shared without their consent. This can lead to reluctance to share data, limiting how much data insurance companies can collect and use. Consumers may question whether it is worth giving out their private data for a discount on their policy.

Secondly, strict data protection regulations in many jurisdictions govern how personal data can be collected, stored, used, and shared. These regulations often require companies to obtain explicit consent from individuals before collecting their data and to implement robust measures

to protect this data. Non-compliance can result in legal issues and reputational damage. Insurance companies must carefully navigate these regulations, which may lower the adoption of new technologies and limit the scope of data usage.

Moreover, using personal data from smart devices can lead to discriminatory practices. For example, if insurance companies use data from health-tracking devices like fitness trackers or health-monitoring apps to adjust premiums, this could discriminate against individuals with health conditions. That, in fact raises ethical issues that must be addressed. This could result in a new form of discrimination, as people with health issues, pre-existing health conditions, or those with unhealthy habits could be burdened with additional costs or be excluded from obtaining insurance. What is more, the use of personal data from smart devices might deepen existing inequalities in healthcare. For example, people from lower socioeconomic backgrounds, who may have less access to technology and resources for maintaining good health, could be disproportionately affected by higher premiums based on their health data. This could further widen the healthcare access and affordability gap between different population segments.

Lastly, the risk of data breaches is a significant concern. Given the sensitive nature of the data collected by insurance companies, they are attractive targets for cybercriminals. A data breach can result in substantial financial costs, loss of customer trust, and regulatory penalties.

Using smart devices offers significant potential for the development of the insurance industry, yet data privacy concerns pose a significant challenge. In addition, insurance companies must carefully balance the benefits of leveraging data from smart devices with respecting privacy, complying with data protection regulations, and maintaining customer trust.

6. Conclusion, limitations, and future research

6.1. Conclusion

Based on this Work Project findings, by analyzing the business model based on the business model canvas framework, is it possible to state that new technologies do impact business model in the insurance industry. They allow to shift from a product-centric to a customer centric approach, mainly due to the ability to collect accurate data and analyze it with all sorts of algorithms that were not previously available. As a result, new concepts and business models are being developed, such as on-demand insurance or usage-based insurance. Answering the research question: how new technologies impact the business model in the insurance industry, it can be stated that they can bring many benefits for businesses. Through analysis of the two technologies described in the Work Paper: smart devices and artificial intelligence, it can be concluded that smart devices collect data that provides insights about consumer habits, behavior, and preferences, while AI algorithms and tools facilitate the processing and interpretation of this information. Subsequently, this data can be used to enhance the understanding of consumers, develop better personalized products that respond to individual user needs, better assess risks, and therefore optimize pricing strategies. Furthermore, these technologies contribute to more effective marketing activities and establish stronger customer relationships, leading to increased customer retention. Overall, integrating these technologies makes companies more competitive and better equipped to generate value for their stakeholders.

However, it must be remembered that along with the dynamic development of new technologies, legal aspects are also developing, aimed at protecting personal data and privacy in the digital transformation era, which may not allow for such rapid adoption of those technologies by companies. Insurance-related data, driving habits, and health data can

be particularly sensitive and, on the one hand, allow for ideally personalized purchase plans, but on the other, poses a real threat to one's privacy.

6.2. Limitations

While this work project aimed to provide a comprehensive understanding of new technologies' impact on the insurance industry's business model, certain constraints may have impacted the scope and depth of the findings. Acknowledging these limitations is essential to provide context for the analysis and identify areas for future research. One of the limitations of this study is the inability to conduct a comprehensive analysis of financials to evaluate the impact of new technologies a company uses on its performance. Ideally, a thorough examination of companies' financial data would provide valuable insights into how different tools' implementation affects financial performance. However, the assessment is restricted to secondary data due to the lack of access to such information. Consequently, this limitation might affect the comprehensiveness and depth of the study's findings, potentially leading to a less robust understanding of the true impact of new technology adoption within the insurance sector.

Another constraint is the amount of data and information, which is limited. The use of new technologies is a relatively new concept, gaining ground all the time. Thus, companies may not yet be giving public notice of how exactly they are using these technologies to gain a competitive advantage in order not to disclose too much information. Therefore, there is insufficient data on specific technologies and tools, as well as how exactly they are used by companies which can lead to an incomplete understanding of the effects of each technology on the insurance business model.

6.3. Future research

Building on the findings and acknowledging the limitations of this study, several opportunities for further exploration can be identified.

First, primary data collection can address the limitations associated with secondary data. Future studies could collect primary data through surveys or interviews with industry experts, insurance companies, and technology providers. This approach would allow for a more tailored investigation of the research topic and help uncover new insights.

Following this approach, a comparative analysis could be done. Future research could focus on comparing the impact of new technologies on business models across different regions, insurance segments, or company sizes. Such analysis would help identify trends, best practices, and unique challenges various market players face.

Moreover, to gain a deeper understanding of the effects of individual technologies, future studies could investigate the impact of specific innovations, such as blockchain, on business models within the insurance industry.

In conclusion, while this Work Project research has shed a light on the impact of new technologies on the business model in the insurance industry, there is still some gap to explore in this rapidly evolving field. Undoubtedly, addressing the abovementioned studies would positively influence the quality and depth of analysis and improve the topic's understanding.

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8. Appendices

8.1. Case study 1. Company: Metromile (Metromile 2023)

Metromile is a US-based insurtech startup founded in 2011, which offers pay-per-mile auto insurance through its smart device technology. The company's innovative approach to car insurance aims to cater to low-mileage drivers who may find traditional insurance policies expensive and inefficient.

Smart device

Metromile Pulse - Metromile's core offering is powered by its proprietary smart device, the Metromile Pulse. The Pulse is a small wireless device that plugs into a car's OBD-II (On-Board Diagnostics) port, typically located under the dashboard. Once installed, the Pulse collects driving data, such as miles driven, speed, and GPS location and transmits it securely to Metromile's platform.

Advantages

1. **Personalized Pricing:** Metromile's pay-per-mile model provides personalized pricing based on actual miles driven, allowing low-mileage drivers to save on their insurance premiums compared to traditional flat-rate policies. The less a customer drives, the less they pay.
2. **Real-Time Driving Data:** The Metromile Pulse allows policyholders to access real-time driving data through the Metromile mobile app. Customers can monitor their driving habits, track car location, and receive insights on improving fuel efficiency or reducing wear and tear on their vehicles.
3. **On-Demand Claims Processing:** Metromile's platform utilizes AI-driven claims processing, simplifying and speeding up the claims process. The real-time data the Pulse collects enables faster, more accurate claim assessments and settlements.

4. Value-Added Services: Metromile offers additional services through its app, such as vehicle health monitoring, street sweeping alerts, and assistance in locating stolen vehicles. These features provide added value to policyholders, improving customer satisfaction and retention.

Financial data (Investing.com n.d.)

Metromile has raised USD 510 million in funding over nine rounds. Currently, it is registered under the ticker NASDAQ: MILE. For the full year 2020, Metromile reported a total revenue of USD 35 million and a negative net income of USD 120 million. For 2021 the total revenue amounted to USD 104,9 million, and the negative income of USD 216,46 million.

8.2. Case study 2. Company: Hippo (Hippo 2023)

Hippo is a US-based insurtech company founded in 2015, which offers a modernized approach to home insurance by leveraging smart home technology and data-driven solutions. The company's primary goal is to provide homeowners comprehensive coverage, proactive protection, and a seamless customer experience.

Smart device

Hippo partners with various smart home technology providers to offer a Smart Home Kit, which includes various devices such as water leak detectors, smoke and carbon monoxide detectors, and smart home hubs. These devices are designed to monitor and protect the home, providing real-time alerts and insights to homeowners.

Advantages

1. Proactive Protection: Hippo's Smart Home Kit helps homeowners identify potential issues and hazards before they escalate, reducing the risk of damage and the likelihood of filing a claim.

2. **Data-Driven Pricing:** Using data collected from smart home devices, Hippo can more accurately assess risk and offer personalized pricing for its customers.
3. **Streamlined Claims Process:** Hippo's technology enables a more efficient claims process, allowing homeowners to file claims online and receive faster settlements.
4. **Modern Coverage:** Hippo offers a comprehensive and flexible insurance product, which includes coverage for modern homeowner needs, such as home office equipment and electronic data recovery.
5. **Customer Experience:** Hippo provides a seamless and user-friendly experience through its online platform and mobile app, simplifying policy management and claims filing for homeowners.

Financial data (WSJ 2023)

Hippo has raised USD 1.3 billion in funding over ten rounds. Currently, it is registered under the ticker NYSE: HIPO. For 2021, Hippo reported a total revenue of USD 91 million and a negative net income of USD 371,4 million. For 2022 the total revenue amounted to USD 119,7 million, and the negative income of USD 333,4 million.