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## **THE EFFECTS OF NEW TECHNOLOGIES ON THE INSURANCE SECTOR: A PROPOSITION FOR UNDERWRITING QUALIFICATIONS FOR THE FUTURE**

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### **Abstract**

The aim of this study is to offer a pioneering perspective on how new technologies may affect the core business functions in industries, while presenting an example through the lens of the relationship between the insurance sector and underwriting. Unless otherwise noted, the scope of the study is international. In this article, new technologies and their use in the insurance sector will be discussed and the effects of these technologies on the underwriting process will be examined. Also, the study will investigate the effects of the digital transformation on the insurance sector workforce, especially on underwriters while new technologies and their use and effects that insurance companies should consider in order to assess their current state and improve their underwriting capabilities as organizations. In this respect, industrial revolutions, industry 4.0 and its effects on the workforce, digital transformation and its implementations in the insurance sector are examined. Relevant competencies are identified and categorized based on the current challenges posed by new technologies. A comparative literature analysis was performed to identify the existing qualifications of a competitive insurance underwriter. The competencies and skills that make up these qualifications are determined and logically matched with the new competencies which are created by the nascent challenges of the new technologies. According to the results of this study, gaps between the extant competencies of workers as compared to evolving required qualifications are widening very fast, which indicates an urgent need for an increased level of education for the workforce. In addition, the particular competencies of an insurance underwriter that should be prioritized for development are revealed. Based on our investigation of the insurance industry; preparedness for both disruptive and transformative challenges, better talent training programs, and increased up skilling training activities in order to maintain competition and furthermore, focus on building differentiating capabilities are recommended.

**Keywords:** New Technologies, Insurance, Underwriting, Skills, Competencies, Qualifications

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## **1. Introduction**

The digital transformation is changing the way of doing business while affecting the required skills and competencies of the workers involved. Due to the continuous increase of automation in the insurance industry, the number of work roles with a high level of complexity is increasing very rapidly. The human capital attraction, retention and re-skilling challenges in the insurance industry intensifies due to the combined effect of economic, social, technical, environmental, political and legal challenges. Moreover, there is the risk of workforce obsolescence due to the immense pace of business transformation. Subsequently, two important questions raised by this paper are especially relevant.

Firstly, which competencies and skills will retain or increase their value, and which ones will disappear due to digital transformation in the industry? Secondly, how can insurance companies maintain a well-qualified workforce? To meet these questions, smart production systems have been activated to create the necessary flexibility and capacity. Other operations are more complex and intertwined; but simple and monotonous processes are automated. For that reason, qualification strategies are required for the current workforce. Employees need to be able to undertake more coordinated, strategic and creative activities. Accordingly, main challenges in Industry 4.0 have been identified by conducting a comprehensive literature review during the study.

Based on a more detailed analysis of these challenges, it is possible to draw up a list of core competencies for employees in general and specifically for insurance underwriting qualifications and to compare them with the most recent and relevant studies on future job qualifications. The next step involves visualizing the main qualifications of insurance underwriters. In addition to insurance underwriting, the model can be used for other insurance specific professions including sales/brokers, claims and financial planners.

The structure of this paper is as follows. The following two sections investigate the issues outlined above using two complimentary perspectives. The first two are macrospective and deal with the new technologies and their transformative effects on workforce in particular. The third is microspective and deals with the effects of new technologies in insurance sector and investigates the subsequent transformation in the required skills and competencies for insurance workers and more specifically for insurance underwriters. The summary of the findings and recommendations is presented in the fourth section.

## **2. New technologies and their uses in the insurance sector**

### **2.1. Industry 4.0**

Industrial revolutions tend to shape almost everything within people's daily lives. The original industrial revolution was driven by the discovery of steam engines in the 18<sup>th</sup> century. Water and steam-powered engines and machines were developed to mass production of goods. Everything was produced by hand before the first industrial revolution — but that phenomenon changed all that. The swift modification of production technologies led to new social-economic structures.

Industrialization has been a shift to powerful, special-purpose machines. The development of the steam engine played a central role in transport, communications and banking in the first industrial revolution. While industrialization led to increased product volumes and diversity, and for some to an improved standard of living, it also led to ruthless employment and living conditions for the poor and working classes.

The second industrial revolution was another major breakthrough in technology and society. New developments in steel production, oil and electricity led to the introduction of public automobiles and aircraft. Emerging towards the end of 19<sup>th</sup> century, the second industrial revolution lasted until the beginning of World War I, culminating in the first moving assembly line of Henry Ford's mass produced model T in 1913. From the economic and social perspective, the first two revolutions caused immense change, including: workforce migration (from rural to urban areas), the fear of job loss, and increased living standards.

The third industrial revolution witnessed the rise of electronics. The invention of transistors and microprocessors led to the rise of telecommunications and computers. These new technologies have led to the production of miniature materials to open doors, especially in the fields of space research and biotechnology. Third revolution has led to two major inventions that have led to a high level of automation in production: automats - programmable logic controllers (PLCs) and robots. The first programmable logic controller (PLC - 1969), the first microcomputer Altair 8800 (1971) and Apple's first computer Apple I (1976) were produced at the beginning of this period.

As well as the first two industrial revolutions, the third industrial revolution had important economic and social impacts including;

- Increased automation of production,
- People empowered to “higher level jobs” – i.e. programming,
- Automotive industry use of robotics.

Industry 4.0 can expand exponentially, and it is characterized by incorporating technology that completely blends lines between physical, digital and biological spheres into root industries around the world. The scope and depth of these changes is a sign of transformation for all production, governance systems and management. Industry 4.0 is used as a label for the adoption of advanced and potentially disruptive technologies, including, but not limited to, digitalization and artificial intelligence. The phenomenon of Industry 4.0 was first introduced in 2011 in Germany as a proposal for the development of a new concept of German economic policy based on high-tech strategies (Mosconi, 2015).

“The fourth industrial revolution” and the term “industry 4.0” have been used almost synonymously. However, terminology is already rooted even if the definitions of these terms are rather unclear. It impacts a wide range of technologies from 3D printing to drones, to advanced robotics in production – and much more. The terminology includes emerging science and engineering developments such as; photonics, biotechnology, nanotechnology, micro-technology, advanced materials, and radical changes to energy and environmental technologies. In regard to industry 4.0, one cannot limit thinking to robotics and the automation of production because it is a digitization of business processes as a whole; it involves the adoption of a contract over the procurement of materials, and how the product “gets” through production and is finally delivered to the customer. In this area, organization expects automating processes that will require a certain automaticity of the workers. The free-thinking capability or skilled human workers will still be critical to the process. However, added value will be found in new products and new solutions—machines will increasingly be able to handle figures, so that humans can focus on the creative aspects of the work (Kane *et al.* 2015; Schlechtendahl *et al.* 2015). In industry 4.0, the use of I.T. goes in parallel with the move towards the following principles: more autonomous decision making; change in the current roles of workers; new industrial, organizational and collaborative models; connecting cyber-physical systems with security and by design; and turning data into intelligence, decisions and new business models.

Innovation will create jobs in the future, but they will be in occupations other than those destroyed by technology, and will be characterized in particular by a low share of routine tasks and a high share of tasks that require creative and social skills. This includes many health, education and social occupations (European Parliament, 2018).

Industry 4.0's primary goal are process improvement, automation, efficiency and production optimization. The more mature goals of Industry 4.0 are innovation, the transition to new business models and the transition to new sources of revenue through information and services. According to Stockwell (2017), four components combined together bring industry 4.0. These components are instrumented, interconnected, inclusive and intelligent. Innovation through new technologies is a key driver of change in the financial sector and this has led to immeasurable efficiency gains, even though these changes can initially be accompanied by uncertainty and doubt (OECD, 2017).

## **2.2. Big data and analytics**

Big data is defined as streams of abstract information of all kinds of data gathered from internal and external like CRM systems, customer contact, billing, market research, social media, mobile data and more. Together this data can be able to deliver value for both the company and the customer, through deeper understanding of customer behavior, brand performance and market development.

Big data analytics transform the insurance sector in such a way that the easy collection of customer data and deep analysis are possible through reducing fraud and wasted time, pricing premiums more swiftly, and self-servicing policies. Data analytics contribute to the profitability of their book of business, tweaking sales practices to improve those profits, reducing wasted time with policyholders, increasing per-agent and per-customer profitability, and maximizing overall performance for the insurance sector in general. The emergence of big data analytics and artificial intelligence has triggered an arms race in the development of new applications along the entire insurance value chain, both by InsurTech startups and established insurers (The Geneva Association, 2018).

Applications of Big data analytics can improve pricing and boost profitability, achieving more precise customer segmentation and enabling stronger risk identification and underwriting efficacy. As its potential results, customers gain increased responsiveness, improved pricing and tailored experiences created through sensor inputs, Internet of Things (IoT) and numerous other applications. Big data analytics incorporate advanced techniques to analyze huge and diverse datasets with different kinds of structures with the purpose of finding useful and targeted information.

Big data is expected to help underwriting, better pricing and risk selection, product development, better management decisions, loss control and claim management, understanding customer needs, marketing and sales in the insurance sector.

## **2.3. The cloud computing**

Cloud computing is a type of computing service for storage, databases, and software that relies on shared computing resources instead of local servers or personal devices. Cloud is defined as a colloquial term used to describe a service that utilizes the concept of cloud computing. Businesses are depending on applications that run reliably and securely and its costs depending of the scale requirements of that business.

Most of the things can be done in a traditional data centre available with cloud web services as well. These services are available on a pay-as-you-go basis. As organizations can use compute, storage, database, application services and deployment management tools whenever they need, they can elastically scale up to meet their customer needs or scale down again quickly and saving money. This function of the cloud computing allows organizations to get through the heavy lifting of racking and stacking servers and allows them to focus on adding differentiating value for their customers. This helps drive innovation by making new ideas feasible that were once out of reach.

The cloud helps organizations to respond faster to changing business and customer demands and lower costs by lower costs by introducing more automation and by improving the efficiency of organization's I.T. environment. Cloud computing makes possible to manage many virtualized resources and thus to use applications and services. Insurers are taking advantage of the cloud to gain access to new customers and new markets, to increase customer loyalty and to enable new business models and applications.

## **2.4. The Internet of Things**

The Internet of Things (IoT) refers to the network of machines, devices, objects that can transfer data amongst themselves without the necessity of human presence by utilizing internet connectivity and communication technologies. It provides connection, logging and receiving data via the Internet of computing devices embedded in log objects.

IoT is an evolution of mobile, home, work and embedded applications that are connected to the Internet, which include more computing capability and use data analytics to achieve meaningful results. IoT is a vast network with connected devices. These devices collect and share data about the environment in which they are used and how they work. A key feature of the IoT is the vast quantity of data that it generates or attracts. Appropriate data management is therefore a pivotal factor to perceive whether the vision of the IoT becomes a reality (Cooper and James, 2009).

Business insider intelligence services estimate that 24 billion IoT devices would be installed by 2020. While the current estimations of total IoT revenue in 2019 is exceeding 357 billion USD, this results in a lot of job opportunities in the I.T. industry. When these devices and intelligent systems of systems are shared over the cloud and analyzed, they will transform the businesses, social life and the environment in countless ways.

IoT can effectively include a more detailed level of sensors, hence price and assess the risk, for example, warehouses risk. Supplier network management also applies to motor insurance for (fleet) garages and liability insurance for managers and officers for lawyers. Venture capital mapping means an electronic platform for changing new forms of securities linked to insurance companies; it allows insurance companies to transfer risks from the market, as it is already the case with some commercial line insurance companies.

## **2.5. Blockchain**

Blockchain is a distributed and decentralized system in which digital information such as transactions are linked using cryptography and stored in a public database. Blockchain is a technology consisting of a growing list of records, called 'blocks', which are linked by cryptography to ensure the security of exchanged information, money and so on. A single block contains a timestamp, the digital information, and the cryptographic hash of the previous block where a mathematical one-way function maps the data in the block to a string of a fixed size, impossible with the current available computing power to revert back. The irreversibility of the function provides the security of the system where a malicious actor altering a single block's information would result in different hashes of the block and all the subsequent blocks' hashes calculated from each previous block, therefore requiring the malicious actor to provide enough computing power for virtually impossible difficulty of calculations. Blockchain system was first introduced in the first cryptocurrency Bitcoin's white paper, authored by an unknown individual or a group of individuals under the name Satoshi Nakamoto as a decentralized solution to the double-spending problem.

The internet has changed the world by decentralizing information while the blockchain is going to decentralize everything else and it is going to affect the economy. Blockchains store information across the network of personal computers, making them not just decentralized but distributed. This means no individual or institute nor any company owns the system, yet everyone can use it and help to run it.

Blockchain provides new opportunities to reduce administrative costs through automated verification of claims or any kind of payment data from third parties, such as:

- **Smart Contracts:** Smart contracts are digital insights between buyers and sellers that can be stored as blocks using block chain technology. Insurance companies also make arrangements when selling their products and insurance policies to their customers. Smart contracts are self-enforced and are therefore traceable, transparent and irrevocable. Smart contracts can also automate the demand mediation process, which ensures that insurance companies as well as claimants are protected from counterfeit programs.
- **Identity Tracker:** Blockchain will allow all people to create a global identity that will be secured by encryption and will be shared with authorized people and organizations as and when necessary. This identity will be unique and will thus prevent fraud and invalid claims.

- **Digital Record Keeping:** Global Identity and relevant details of the insurer can be digitally recorded in blocks. These blocks are stored for an infinite period of time, and the accuracy of the records is maintained by hashing and encryption techniques. Therefore, records can only be accessed by legitimate users, such as insurance company personnel and individuals.
- **Customized Insurance Products:** All customers' needs and needs are variable and therefore not all products are suitable for everyone. People need more humane policies to meet their personal needs. Blockchain can help the insurance company design policies and products based on customers' situation. Blocks will store real-time and accurate data to encourage insurance companies to look beyond real value and serve their clients with the desired policy protocols.
- **Premium Costs Reduction:** Insurance companies can design personal accident insurance and products that can create a transparent and simplified process for paying monthly premiums for insurance policies.

Smart contracts provided by Blockchain allow immediate payments from a customer's financial account. In this way, contract processing and payment verification procedures are facilitated. Thus, the cost of acquiring customers decreases for insurers. In brief, Blockchain technology will bring numerous innovations to the insurance sector along with the other innovations mentioned in this section.

## **2.6. Artificial intelligence**

Artificial Intelligence is generally deemed as the wider concept of machines being 'smart' in the sense that machines have the ability to manage the process and execute the tasks. Machine Learning is also related to the Artificial Intelligence because it assumes that human allows the data inclusion into the machine so that machines can learn by themselves. Deep Learning is a branch of Machine Learning where algorithms attempt to model high-level-abstractions in data. Artificial intelligence is a broad branch of computer science. The goal of A.I. is to create system that can function intelligently and independently.

In insurance, A.I. can be widely used to improve the claims process without any human intervention by using the technology to report the claim, capture the damage, audit the system and finally communicate with the customer. Also, machine learning allows the insurers to utilize from the artificial technology in a better way through significant reduction in processing time and in emerging fraudulent actions.

Many insurance companies embraced that A.I. in claims and underwriting, automated processes, improved consistency and efficiency. However, it is constantly evolving for the point of intelligent automation in the back-office to virtual assistants on the customer frontline. A.I. is becoming smarter and simpler to use with touch screen and voice command technology, interaction is becoming easier and natural. From high tech start-ups to well established insurance companies, more and more insurers are using smart part virtual assistance to give customers instant personalized help.

## **3. The effects of new technologies on workforce**

The future challenge - to increase innovation for employment growth - is to cope with increased disparity as a result of technological change. Technological changes with routine and skill biased are two mechanisms that can increase disparity, because they prefer certain groups of labor and reduce the employability of other groups. At the same time, low-skilled employees have a significant share in the adaptation costs of innovation. The workforce that serves routine biased technological changes is at a higher risk of losing their jobs, and improvements made under this mechanism may only reduce the number of jobs that require low qualifications. Existing talent management processes are typically predicated on individuals filling roles calibrated to a fixed job architecture. Job requirements commonly list traditional degrees and established certificates. This model no longer fits: the current marketplace demands that businesses

operate with greater agility than is afforded by these legacy structures and recognize a range of potential skilling trajectories (World Economic Forum, 2019).

The distinction between technological and non-technological innovation says nothing about the economic value of the innovation for the firm and its potential for jobs creation. Organizational and marketing innovations often complement technological innovations and help to unfold their full potential (Brynjolfsson and Hitt, 2000). A decade ago, robots still seemed pretty limited. Today, not so much. The future of the work is becoming the reality of today for millions of workers and organizations around the world. And it is causing some to forecast a future where humans cannot find job. Economists, however, tend to have different views than futurists. One of the reasons a lot of economists are sceptical about robots taking all the jobs is the existing literature of the past. Similar to today's conditions, there was a spike in automation anxiety in the late 1920's - early 1930's when machines were starting to take over jobs on farms and in factories. Automation anxiety of the workers was surged second time in the late 1950's - early 1960's. It can be realized when looking to the old literature that jobs being replaced by machines, yet every industrial revolution created more jobs in the end. However, during the transaction period; more specifically: while the reskilling period for closing the skill gaps for the new job requirements, it is quite harder to visualize the jobs that come from what happens next for individuals or institutions after the industrial revolutions.

The 2018 survey of the WEF on jobs and the change of worker competencies to meet the requirements of job descriptions indicate emerging and declining jobs in the near future as in Table 1.

**Table 1. 10 emerging and declining jobs in 2022**

<b>Top 10 emerging jobs</b>	<b>Top 10 declining jobs</b>
1. AI and Machine Learning Specialists	1. Secretaries Administrative Assistants, except Legal, Medical and Executive
2. User Experience (UX) Designers	2. Insurance Underwriters
3. Digital Transformation Specialist	3. Word Processors and Typist
4. Sales and Marketing Specialists	4. Data Entry Keyers
5. Client Information and Customer Service Workers	5. Bookkeeping, Accounting and Auditing Clerks
6. Innovation Professionals	6. Computer Programmers
7. IT Administrators	7. Inspectors, Testers, Sorters, Samplers and Weighers
8. Cyber Security Analysts	8. Claims Examiners, Property and Casualty Insurance
9. General Managers	9. Postal Service Mail Sorters, Processors and Processing Machine Operators
10. Data Analysts (Financial)	10. Tellers

**Source:** World Economic Forum (2018)

Economists indicate that the warnings about the “end of work” tend to focus only on the direct effects of new technology in job creation – not the labor-saving inventions which create higher productivity. On the other hand, technologists and futurists do not deny that is been true historically, but they question whether history is a good guide for what is to come. Fundamentally, the argument is that “this time it is different”. They further argue that the relation between lost jobs and new jobs will primarily manifest in three situations: time gaps, geographic gaps, and skills gap; and it is critical to mind the gap. Both sides agree that the wealth that technology creates is not shared with most of the workers. The income of the average worker has stayed pretty flat as the global economy has grown. If unemployment stays low, automation might worsen economic inequality, which is already extreme in the world. However, technology is not the destiny and governments with their citizens decide how a society weathers disruption. This is what actually worries people on both sides of the debate about the future of work. On the other hand, for individual organizations, focusing on things that cannot be really controlled by their nature such as environmental, political or legal challenges may risk neglecting the things that can be done.

The race between job creations with new products versus the destruction of jobs from new process technologies was acquired by the creative effects of innovation in the past. An

important lesson from the past is that people tend to underestimate the work that creates the potential of fundamental technological transformations, because most of the population does not have enough imagination and knowledge about the new types of work to be created under the new technological paradigm. However, a successful end is not guaranteed this time when considering the effects industry 4.0. One of the findings of this study is that the new generation of successful workers should have a special mix of being technologically skilled, creative and willing to work in constantly evolving tasks. This means that the scope of work skills will change, as well as the definition of the skilled workforce. This is because the skills that will be most needed in the future workforce are rare skills found in today's workforce, which brings employment problems to the horizon also created by the innovation on manufacturing process that creates the need of reskilling activities for workers. This is expected to create shrinkage in the global supply of skilled workers in the near future. Will there be a subsequent expansion in the supply of skilled workers after the new jobs are created? And if so, how fast can the workforce keep up with the necessary skill-shifts using traditional education techniques? These questions will remain as important arguments.

Employers expect that there will be a significant change in the division of labor between algorithms, machines, and humans for today's work tasks. Today, 71% of the total working hours in industries are covered by humans compared to 29% by algorithms or machines. By 2022, this average is expected to shift to 58% of human working hours, 42% machine or algorithms (World Economic Forum, 2018). McKinsey Global Institute (2017) estimates that, while few occupations are fully automatable, 60% of all occupations have at least 30% technically automatable activities. While 75 million existing job roles can be replaced by changes in the division of labor between people, machines, and algorithms, while 133 million new job roles can emerge simultaneously and quantitatively. Growing professions include roles such as data analysts, software and application developers, and e-commerce and social media specialists - jobs that are largely based and developed on the use of technology. Nevertheless, business roles are expected to grow, which are evidently based on "human" characteristics. These roles include customer service employees, sales and marketing specialists, training and development specialists, organizational development specialists and innovation managers (World Economic Forum, 2018).

According to World Economic Forum (2016), reskilling and upskilling activities become significantly important with the organizations while the challenges from the workforce perspective remain important. Developing skills gaps - both between individual employees and between the top leadership of companies - can significantly hinder the organization's transformation management. Depending on geography and industry, companies are likely to turn to external contractors, temporary staff and freelancers to address their capabilities between two-thirds and two-thirds. A broad approach to workforce planning, re-qualification and skill development will be key to the positive and proactive management of such trends in Table 2.

<b>in 2020</b>	<b>in 2015</b>
1.Complex problem solving	1.Complex problem solving
2.Critical thinking	2.Coordinating with others
3.Creativty	3.People management
4.People management	4.Critical thinking
5.Coordinating with others	5.Negotiation
6.Emotional intelligence	6.Quality control
7.Judgement and decision-making	7.Sevice orientation
8.Sevice orientation	8.Judgement and decision-making
9.Negotiation	9.Active listening
10.Cognitive flexibility	10.Creativity

**Source:** World Economic Forum (2016)



The latest emerging businesses are in line with the global digitalization trend: AI and machine learning professionals and user experience designers need a large number of new technologies needed to meet customers face-to-face, while digital transformation specialists and innovation experts who can use the company's internal structures and business models, are becoming key personnel to help adapt them.

According to World Economic Forum (2018), by 2022, most of the skills needed to do the work will be changed dramatically. In 2022, global skill stability is expected to be around 58%. This means that all employees will see an average change of 42% in the required business skills by 2022 in Table 3. Jobs specialized in routine tasks started competing directly with computers. As computers became cheaper and more prevalent, employers opted for computer-performed routine tasks rather than human-performed routine tasks (Nedelkoska, and Quintini, 2018).

**Table 3. 2022 skills outlook**

<b>Growing</b>	<b>Declining</b>
1. Analytical thinking and innovation	1. Manual dexterity, endurance and precision
2. Active learning and learning strategies	2. Memory, verbal, auditory and spatial abilities
3. Creativity, originality and initiative	3. Management of financial, material resources
4. Technology design and programming	4. Technology installation and maintenance
5. Critical thinking and analysis	5. Reading, writing, math and active listening
6. Complex problem solving	6. Management of personnel
7. Leadership and social influence	7. Quality control and safety awareness
8. Emotional intelligence	8. Coordination and time management
9. Reasoning, problem-solving and ideation	9. Visual, auditory and speech abilities
10. Systems analysis and evaluation	10. Technology use, monitoring and control

**Source:** World Economic Forum (2018)

Utilizing new technologies require sets of technical, methodological, social, personal competencies and will replace various types of tasks with the ones which require creativity, entrepreneurial thinking, efficiency orientation, intercultural skills, communication skills, leadership skills, motivation to learn and sustainable mindset. All are unevenly distributed competencies in the workforce. Growing skills at the forefront include skills such as technology design as well as analytical thinking and active learning, emphasizing the growing demand of various forms of technological competencies.

#### **4. The effects of new technologies on the insurance sector**

The insurance industry has many opportunities to take advantage of technologies across typical areas such as telematics, IoT, predictive analytics and new business models such as pay-as-you-go (on demand services). There is a lot of work in core business functions such as underwriting, claims management and customer service. Increasing expectations are also a challenge for insurance personnel. Enormous training requirements must be met. Around 80 percent of insure-tech investing went to non-life insurance innovations and 67 percent of all insured tech deals have been in insurance automation (Accenture, 2018).

Successful insurance companies leverage the data sources to compete in their industry. These companies manage their mission-critical data centrally with a platform created by their own or by using or partnering the third-party service providers. While the insurance companies use these platforms, they mind analytical insights from complex, unstructured and untapped claims data sources including; notes and diary records, transcriptions, photographs, medical bills, sensors, geolocation events, weather events and social media. Through the platforms, these insurance companies are able to generate the actionable insights necessary to identify fraud, prevent claims leakage, and identify opportunities for subrogation or cross-sell additional products. Combined with the real-time streaming data ingest capabilities of these platforms, the most advanced insurance companies seek to be first through dynamic customer profiles and predictive analytics.

The insurance sector is based on risk and reward estimation and today many insurance companies do so with predictive analytics. Predictive analysis receives large data collected by insurers and uses it to accurately calculate risk. However, having good data is one thing; knowing how to maximize availability is something else entirely. The right level of standardization and out-of-box product capability to reduce total cost of ownership is very important for insurers. As a result, many companies have purchased modern “rules and tools” core systems over the past five years. Most of the insurance companies are looking to extend these tools across the business to leverage their investments.

The next generation of successful insurance workers must have a unique mix of willingness to work in a process that is increasingly demanded and technologically adept and creative. The static process evolves into a mixture of semi-automatic and machine-assisted tasks that are constantly evolving. However, most of the complex core business functions will still require specialist workers because – by their nature – their work mostly requires more “human efficient” competencies – which are less suitable for A.I. to handle. Such competencies as leadership, creativity, entrepreneurial thinking, complex problem solving, and decision making are still quite outside of A.I. or other automation’s capabilities. So, despite the upcoming automation, work that requires human interaction will become more significant to excel in differentiating capabilities. Therefore, complex and core business workers will be managing and working alongside with the A.I. increasingly. Doing so is required to successfully build differentiating capabilities for the organization. For example, machines that speak with machines will provide insurance companies with important capabilities to automatically process higher application volumes and to collect and parse evidence faster and more reliably than ever before.

Underwriters spend less than half of their time processing core information and instead are burdened with mundane tasks such as data entry. A.I. can free them from these tasks to focus on higher-value activities that drive faster, more accurate decisions. Therefore, it will be essential for underwriters to use their analytical skills more often. However, even if analytical skills are not rare among these professionals in terms of overall proficiency, there are many other important methodological, personal and social competencies such as creativity, entrepreneur thinking, sustainable mindset, motivation to learn, intercultural skills, language skills, ability to transfer knowledge and most importantly (and least common) leadership skills: all are not the common skills among the workers.

The new technologies are transforming the required job qualifications while affecting the related competencies and skills of the workers. The European Qualifications Framework (EQF) is a common European reference framework whose purpose is to make qualifications more readable and understandable across different countries and systems (European Commission Education and Culture, 2008). In this section of the study, we used the EQF level descriptor elements to further investigate the skills and competencies. EQF level descriptor elements are defined by an extensive process building and widespread expert consultation concerning to EQF research and with the contributions of European Commission, European Training Foundation and UNESCO. Level descriptors are essential elements of national qualifications frameworks (NQFs) established and implemented beyond across Europe. NQF Defines what learning outcomes mean by explaining what an individual has to know, do and understand, at a certain level.

Comparing to the global qualifications framework, NQFs are more detailed because of the availability of the data among the EU countries and the additional countries that provide data regarding their EU membership processes and collaborations; competencies and skills defined by the needs of the qualifications in working life within this framework. Although the level descriptors for categorization of qualifications in NQFs vary, level descriptors in the European qualification frameworks are quite similar with NQFs’ and standardized in the EQF.

Insurance specific and main occupations are the sales including intermediaries, claims, underwriter and financial planners under the Sectoral Qualification Framework which is a method of identifying knowledge, skills and competencies specific to the European insurance industry and based on national tests. Eficert has developed the EQF (European Qualification Framework), the NQF (National Qualification Framework) and the European Qualification

Standard for employees in the European Insurance Sector. According to the comparative literature review we conducted in this part of the study, it is seen that the most comprehensive study of the skills, competencies and qualifications of the employees in the insurance sector is SQF. Although this study has been discussed in many countries in addition to European countries, it is parallel to the studies accepted in other geographies across the world. By the comprehensive literature review between the qualification frameworks across EU, non-EU countries – such as Turkish Qualification Framework (TQF) – and US, UK and Common-wealth countries' qualification frameworks, it has been concluded that for every insurance professional regardless of their specialization, there are two basic competencies: technical and business. Claims, underwriting and sales specialized competencies comes on top of those basic competencies according to area of the specialization.

Workers who have the required skills for core business functions are the key for building differentiating capabilities in insurance sector. This aspect will be a crucial topic for upcoming talent management issues within the sector especially for critical-skilled employees and the required work skills for their jobs, as the nature of their work cannot be handled by machines but will continue to evolve alongside them. As the requirements in competencies and skills change, and the importance of building on differentiating capabilities widens, successful frontline insurance workers and their skills will be in high demand and thus the situation may result in a skilled-worker shortage in the insurance sector. Therefore, this scenario must be considered in all its detail by any management of an insurance company.

The new ways of producing that are emerging as a result of industry 4.0 require professionals with a background different from existing ones. Integration among the various forms of knowledge, which is typical of this new production system, will demand multidisciplinary teams with a high level of technical expertise and the capability of interacting with different fields of knowledge. This is especially true for complex core business functions which build differentiating capabilities.

## **5. The effects of new technologies on underwriting qualifications**

The role of the underwriter is evolving with the effects of the new technologies. In addition to their technical, business and specialist competencies, their responsibilities include; supporting the sales function, data driven decision making, customer advocacy and innovation. From the perspective of sales support underwriters can evaluate lead quality and participate in marketing campaigns to increase the cross and up sell opportunities. Data science and data driven decision making capabilities are critical during the automation in underwriting processes which help insurance companies to operate precisely and effectively. From customer advocacy perspective underwriters can focus on delivering a better experience for intermediaries and customers by coordinating account services while mitigating risk exposures and dealing with claims management. Innovation in underwriting requires a remarkable ability to use business intelligence and analytics, predictive modeling, intermediary relations, exposure mitigation strategies and customer focused services and more.

By extensive comparative literature review and in the light of the latest developments in the technology, we identified the future qualifications of an insurance underwriter as stated in this section. During the review period, we identified two main and basic competencies for insurance workers: technical and business-related competencies. On top of these two-insurance related fundamental competencies; a third layer: competencies for specialist underwriters were also identified by using the competence model.

Technical competencies are mainly about insurance principles, practices, products, services, legal knowledge, compliance, risk assessment, claims knowledge, underwriting and pricing skills or sets of skills. On the other hand, business competencies are more about company and market knowledge, customer understanding, communication, information management, planning, negotiation, people management and persuasion skills. On top of technical and business competencies, insurance underwriters must possess the ability to use four more skills or sets of skills. These are risk perception and assessment, risk pricing, process understanding and underwriting management.

Advancing technologies change the civilization while any type of change creates its own benefits and challenges. Industry 4.0 creates new opportunities for companies, it also presents a variety of challenges arising from ongoing automation and digitization. Extensive literature reviews during our study presented the economic, social, technical, environmental, political and legal challenges of the Industry 4.0. The logical deduction of required core competencies for employees was derived from identified challenges by using PESTEL framework. This step comprises the clustering of competencies into four primary categories. The required set of skills and competencies in industry 4.0 were aggregated under these four categories: technical, methodological, social and personal competencies as shown in Table 4.

**Table 4. Visualized competence model for an insurance underwriter**

	Rare skills among the underwriters	Important skills of an underwriter	Rare skills among the workforce
<b>Technical Competencies</b>			
Technical (job specific) skills		x	
Process understanding		x	
State-of-the-art knowledge		x	
Understanding IT security	x	x	
Coding skills	x		
Media skills	x		
<b>Methodological Competencies</b>			
Problem solving		x	
Research skills		x	
Analytical skills	x	x	x
Decision making		x	
Entrepreneurial thinking	x	x	x
Conflict solving		x	
Efficiency orientation		x	
Creativity	x		x
<b>Social Competencies</b>			
Compliance		x	
Sustainable mindset	x	x	x
Flexibility		x	
Motivation to learn	x	x	x
Ambiguity tolerance		x	
Ability work under pressure		x	
<b>Personal Competencies</b>			
Communication skills		x	
Compromising skills	x	x	x
Ability to transfer knowledge	x	x	x
Networking skills		x	
Intercultural skills		x	x
Language skills		x	x
Ability work in a team		x	x
Leadership skills	x	x	x

Source: Authors' own preparation

This visualized competence step will further increase the transparency to understand competence requirements and helps the user to detect competence gaps at first sight. Rare skills among the workforce indicate the critical competence gaps those need to be closed with the qualification standards and education towards the qualifications. Important skills of an underwriter indicate the technical, business and underwriting specific skills and competencies which are also indicate the current required skills and competencies of a competitive insurance underwriter. Finally, rare skills among underwriters indicate the skills and competencies those will retain their value or will become important in the future for insurance underwriting.

This section of the article is to illustrate how the developed competence model for an insurance underwriter can be used in practice. Underwriters can make improvements in overall

for closing the gaps between their extant and future competencies. This is of special importance for the insurance sector since the competence model shall be tested and used in a mutual research projects by all sector related actors.

## **6. Findings**

Today's insurance workforce faces challenges from several aspects while some of them are considered as intensive factors related to the technological and cultural transaction period such as; creativity, technical skills, understanding I.T. security, entrepreneurial thinking, efficiency orientation, intercultural skills, communication skills, ability to be compromising and cooperative, ability to transfer knowledge, leadership skills, motivation to learn and sustainable mindset. From the perspective of talent management, the necessary work skills of the future are the rare skills among the workers of today. These include complex problem solving, critical decision making, analytical skills, creativity, people management, sustainable mindset and motivation to learn. These work skills are mainly rare skills because there is a deep mismatch between the skills our education systems nurtures and the need of society. We live in autonomous automobiles, reusable rockets and artificial intelligence, but we are still teaching in a training system designed for factory workers 200 years ago. Instead, institutions need to focus on skill development and make any student in compulsory or lifelong learning successful.

Future work skills and related talent management issues will be important challenge for HR perspective. Today, talent management-wise, HR divisions of insurance companies are mainly involved with the following topics:

- Setting up new technical courses to meet specific requirements,
- Redesigning courses in the fields of engineering, business administration and others, with an aim to meet the requirements arising from new technologies,
- Setting up multidisciplinary production management courses, with a focus on Industry 4.0,
- Encouraging the implementation of technological training programs within companies.

The comparison between the 2022 skills outlook and 2015's required skills can be a good opportunity for the senior managements of insurance companies to evaluate to current situation of the workforce, especially when setting goals related to talent management through the transformation period. Creativity, authenticity and human, skills such as initiative, critical thinking, persuasion and negotiation will protect or increase their values. The insurance sector must fully comprehend the requirements of the jobs because successful adaptation for future work skills will be the designating factor in respect of successfully building on differentiating capabilities. This is especially true for more complex corporate business lines, where A.I. and other automation capabilities will still be quite limited.

## **7. Conclusion**

Globalization is entering a new era and the change in the economy will be drastic. In the global economy perspective, the East-to-West trade flows will be replaced by regional trade flows in the near future. This means that for mature economies, manufacturing will be back home. Which will be creating more productivity and more growth? But growth does not come automatically. Mature economies will have to seize it and in order to achieve this, they will have to massively re-train their workforce. On the other hand, developing markets are facing several more challenges such as access distance to new technologies and knowledge at the same time. The markets must be ready for disruptive or transformative challenges; only the countries, organizations or societies which will boldly transform will be able to seize the opportunities of industry 4.0.

In times of rapid change, it is hard for executives to separate fact from fiction; it is easy to be seduced by the "latest trend," and tempting to be drawn into blindly copying what the competition is doing. Following the crowd is not the answer, however. The most successful

companies, across industries, understand that they have to build a strong and distinctive identity which allows them to carve out their own market position, rather than reacting to a market that has been created by others.

Creating such a strong identity means that an organization must be very clear about the way they will add value to their customers in the future, and also be very focused on acquiring the few differentiating capabilities that will allow them to deliver that value better than anyone else. Once they know which capabilities their organization needs to excel at, they can then develop a capability agenda to take their organization from where it is today to where it needs to be tomorrow. It is important to consider how quickly an organization can build these new capabilities and by when it will need them to be mature and integrated. Consequently, top management will face options to decide whether they organically develop capabilities, acquire them through M&A or partner with other players to attain the required capabilities.

Being very clear about the specific capabilities an organization needs to excel at allows them to focus their entire workforce on what truly matters for their customers and build a powerful engine of growth. On the other hand, being sustainable at the same time mostly relies on the culture of the organization as the workforce operates the technical capabilities, which are also rapidly shaped by the new technologies. This aspect is mostly dependent on middle management and critical-skilled employees and their willingness to embrace the new ideas. This is a very important challenge that requires extraordinary attention from the senior or top management. Disruption is here to stay, and not everyone will succeed. It is the players who have the courage to commit to an identity based on what truly differentiates them that will have the opportunity to shape the insurance industry of the future. In that regard, cultural transformation is one of the most important components of organizational innovation and is also the proxy to present a strong “way of play” and build “distinctive capabilities” simultaneously.

Insurance companies must overcome the traditional reluctance of the sector to change or commit fully developed and risk-informed strategies in all business lines and in more than one operational area. They must focus on capabilities not easily replicated and assume a bias toward action in strategies. These strategies are necessary to use these new data streams to improve essential business practices and processes. From this point of view, it is very important to attentively acknowledge both technological and cultural transformation requirements. However, cultural transformation – since it is the more qualitative term – is a “harder to define and harder to read” concept. Therefore, it is harder to be sure that an entire organization accepts and understands “what matters most,” and moves in the same direction as a whole. To successfully work towards the same direction, there should not be any major unsolved disagreements about the technological and cultural transformation milestones at the same time and within the organization. Internalizing “what matters most” as an organization will take not only the senior management’s efforts, but, and this is more essential, the middle management’s acceptance and efforts as well. The key factor in facilitating this acceptance, and the quality of its integration, is the culture of the organization. That culture depends on a mutually held belief in the shared ownership of the enterprise throughout the hierarchy of the organization. The insurance sector must internalize the fact that digital transformation is possible, but not without a substantial cultural shift.

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