Digital Transformation in the Property and Casualty Insurance Industry

Ziboud Van Veldhoven, Anas Alaswad, Sean Barrett, Mark Raymond Robinson, and Jan Vanthienen

***Abstract*—Digital transformation (DT) is becoming increasingly vital for companies as digital technology becomes more integral in society. Although significant literature exists on DT, scant attention has been paid to its impact on the private and casualty (P&C) insurance industry. In this study, a mixed-method approach was used to explore the impact and maturity of DT in the P&C insurance sector by analyzing the literature, industry reports, and conducting an online questionnaire with 13 P&C executives in Belgium, South Africa, and The United States. The study finds that that DT impacts every primary activity of the P&C insurance value chain with various maturity levels. We also report on emerging technologies and their maturity or implementation stage in our sample. These findings can help to foster an understanding of DT in the P&C insurance industry.**

***Index Terms*—Digitalization, digital transformation, insurance.**

I. Introduction

Firms are operating in an increasingly challenging environment due to the advancement of digital technologies. This brings ford a myriad of business and societal changes that is frequently referred to as digital transformation (DT) [1]. In business, DT can be defined as "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies" [2]. Although a significant quantity of academic literature has been written on the topic of DT [2], [3], the impact of DT on the Property and Casualty (P&C) insurance sector has been understudied so far.

P&C insurance is a subcategory of non-life insurance that provides policyholders with certain protections for losses or liability resulting from indemnification of property or casualties. For years, P&C insurance executives have focused on underwriting performance and cost management as two fundamental drivers of performance. Underwriting deals with the nature of prospective risks and managing the portfolio. It consists of risk selection, pricing, coverage, capacity, limit management, and risk spreading [4], [5]. The two metrics commonly used for underwriting performance and cost management are loss ratio (compensation payments and claims expenses divided by earned premium) and combined ratio (loss ratio plus operating expenses to written premium ratio) [4]. The newer insurance performance measure (IPM) not only includes underwriting performance but also reinsurance costs, investment returns, and financing costs [6]. Hence, the IPM is a better measure as it incorporates reserving performance for the long-tail liability while remaining adequate in reducing agency problems when linked to underwriters' performance. In recent years, focusing on the IPM is no longer enough; insurers must consider the DT of the financial industry and of society to stay competitive.

In this paper, we conduct a mixed-method approach consisting of a scientific literature search, industry reports search, and the conduction of 13 online questionnaires with P&C executives to investigate the impact and maturity of DT in the P&C insurance sector. We continue this paper with the methodology. Then, we report the results, followed by a discussion of the findings. The last section concludes this paper.

II. Methodology

In this paper, we want to investigate DT in the P&C insurance industry. In detail, we want to provide an answer to the following research questions

- What is the impact of DT on the P&C insurance industry?
- What is the current DT maturity of the P&C insurance industry?

To answer the first question, an exploratory qualitative assessment of academic literature that deals with DT and insurance was used to identify themes applicable to DT in P&C insurance. We extended this body of knowledge with recent insurance industry reports. These themes were then turned into a questionnaire for industry executives to complement and confirm the existing body of knowledge asking about the current situation, future trends, emerging technologies, and strategic priorities. In addition, we asked our respondents about the current DT maturity state in their company to answer the second research question. The questionnaire was designed to take less than 10 minutes. It was predominantly composed of non-leading, Likert-scale questions complemented with several open questions.

Three countries with different ranks in the 'IMD World Digital Competitiveness Ranking' [7] were selected to obtain a varied response: the United States of America (rank 1), Belgium (rank 25), and South Africa (rank 48). The target population of the questionnaire was senior leaders from P&C insurers or reinsurers – licensed in the respective regions – who engage in the overall strategic decisions. Self-selection sampling is used for the executive questionnaire with participants targeted based on their leadership role (CEO or

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Chief Digital Officer). In total, 80 executives were invited to participate of which 15 responded (response rate of 18.75%) and 13 passed the control variables. Of the 13 respondents, five were from Belgium, seven from South Africa, and one from the United States of America, giving us a varied sample. Eleven respondents are leaders in P&C insurers and two in P&C reinsurers. Eight hold the position of CEO and five of Chief (Digital) Transformation Officer.

III. Results: Digital Transformation and the P&C Insurance Sector

A. Current Situation Threatened

The impact of DT on the P&C insurance industry is substantial. Despite the industry's long-standing history and behemoth size [8], P&C insurers are increasingly under threat by non-traditional players, such as insurtech firms [9] and banks [10]. In our study, eight of thirteen respondents believe that these digital firms pose a credible threat. They offer greater niche products, have better customer experience, are more agile which helps to deal with the rapidly changing environment, and have an innovative focus. As insurtech firms are relatively new and their long-term impact is unknown, our respondents indicate no tendency to acquire these firms. Instead, they prefer using their internal capabilities to closely follow and mirror insurtech's innovation. Regarding banks, our respondents generally agree that DT efforts in the P&C industry lack compared to the banking industry who is increasingly capturing value in the insurance market. Four respondents deem the industry to be comparatively on par, while nine believe that there has been reduced DT effort. Additionally, the competition between insurers is changing towards different fronts than before; customer experience, digital presence, the use of emerging technologies, and micro-services become increasingly important to stay competitive. Together, these changes are threatening the incumbents' positions and pressuring them into DT.

On top, DT is creating new risks for P&C insurers. One risk is that the need for insurance is dwindling in some areas. For instance, Volvo and Mercedes are so confident in their self-driving cars that they are not buying insurance to cover accidents [11]. Secondly, the increased reliance on digital technologies and the rise of the Internet of Things (IoT) creates new cyber risk perils [12] that traditional insurers are not experienced with. DT will force insurers to create new products catering for these perils and to invest more in data management, and cybersecurity.

B. Digital Transformation in Insurance

To deal with the threats, P&C insurers are debarking on a DT journey. Respondents largely believe DT to be important for a sustainable competitive advantage with eleven executives stating that their organizations have an approved DT strategy. The main goal of the strategy, according to seven respondents, is operational cost-saving by automation and digitalization. In detail, they aim for a consistently higher IMP than competitors. Other goals include the generation of new business opportunities, improving the customer experience and relationship, and meeting the rapidly changing customer needs. According to one executive, DT in the customer experience is about "simplifying and speeding up the process, saving customers time and offer convenience".

To implement the DT strategies, investments are required in ICT, business agility, strategy, product development, and so forth. On average, executives believe that 3.77% of Gross Written Premium (GWP) is an appropriate annual expenditure/investment for DT activities; South African respondents indicated a substantially lower average of 2.57% compared to Belgian respondents at 5.2%. With the support of a long-term goal, approved DT strategy, and approved investments, most respondents are showing strategic intent to harness DT.

As DT becomes of strategic importance, a number of companies have created new c-level managerial positions to steer a company's DT efforts [13]. In our study, eight of the thirteen respondents (61.5%) disagree with the sentiment that a dedicated c-suite executive is necessary for DT. Seven respondents believe that the existing CIO can lead the DT effort, followed by five supporting the CEO for this role. Nevertheless, seven of the thirteen respondents indicated that they have or are considering a digital subsidiary to manage the DT activities and digital product delivery.

C. Impact on the Value Chain

DT is changing the incumbent firms on many aspects of their value chain. Insurance distribution, which involves the rendering of advice and selling of insurance contracts, is found to be the primary focus of DT efforts. This involves the digitalization and integration of the related business processes. Additionally, respondents largely see the value in integrating with other ecosystems - such as ridesharing or event ticketing services - with seven of the thirteen executives view technology firms with large networks and ecosystems (such as Facebook and Google) as potential threats. Our sample was not favorable towards building their own ecosystems. Given the high importance placed on distribution by respondents, it is not surprising that 77% are either busy implementing or are already extracting value from DT activities in distribution.

There is also an increased number of channels available to insurers to sell products directly to customers. This includes web, mobile, various software applications, and integrations with existing applications. Increasing customer access may reduce the need for binder broker relationships and traditional brokers may be reduced to offering advice only [11], [14]. Nevertheless, very few insurers in our study are observed to be offering public applications with insurance purchasing functionality. There is still a lot of room to improve upon this area; more integration is needed with the different digital channels to sell through.

Policy Administration is the creation and maintenance of an insurance contract for its entire lifecycle - from the creation of an application, through policy issuance, ongoing contract maintenance, and the ending of the contract. DT in policy administration is aimed at decreasing back-office costs while improving customer experience. Many P&C insurers have turned to web and mobile portals [14], while others are

using process automation to create cost efficiencies for back-office processes [15]. Another innovation is the move towards contemporary insurance services that are flexible, with companies offering a diversified set of personalized products and services [14]. Policy administration is regarded as relatively important by respondents with 61.5% are either busy implementing or are already extracting value from DT. As with distribution, very few insurers have fully-fledged applications in place.

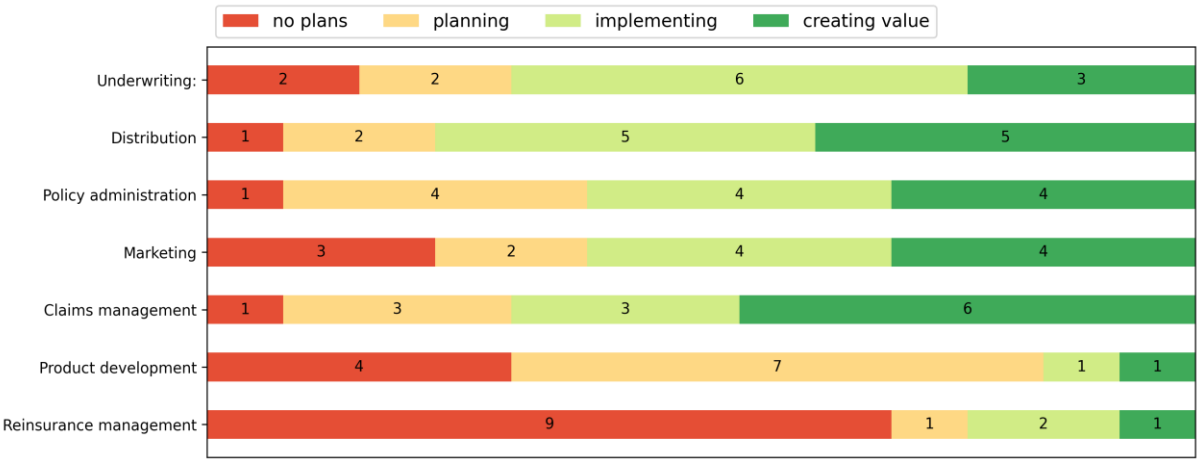

Fig. 1. DT maturity in P&C value chain areas.

Another key area where digital technologies can improve operations is claims management. Traditionally, insurance companies spend significant effort and money handling claims manually [16]. Therefore, creating efficiencies, optimizing payouts, and reducing fraudulent claims is important for corporate performance and IPM [17]. To improve efficiency, companies are automating and integrating all possible business processes. To reduce fraudulent claims, novel technologies such as blockchain and smart contracts are experimented with. Here, a transparent, immutable record can be kept and used to automate the validation of insurance claims by checking behavior, action, and conditions on the blockchain. For example, weather conditions can be automatically published to the blockchain and can later be used to assess the validity of claims for crop insurance [16]. Taken together, claims management can be automated by algorithms that are trustworthy and correct. Smart contracts, for example, can execute the payouts automatically when certain triggers have occurred. While our respondents claim that digitalization within claims management is very mature in the sample, with 69% either implementing or extracting value from DT in this area, the use of blockchain is still in very early phases.

In marketing, the channels through which to run advertisements are changing rapidly. Furthermore, big data and analytics can be used by P&C insurers to better segment and target customers to match their risk appetite [11]. Increasingly, this happens through social media platforms. As companies' digital presence has mostly replaced personal interactions, prospective customers will judge a company through the quality of its digital presence [18]. Marketing is ranked as one of the least important value chain areas by respondents. Nevertheless, marketing is quite mature with 62% of respondents either implementing or extracting value from DT initiatives.

DT impacts the reinsurer-insurer loop when P&C insurers decide to hive off part of the risk and cede premium. The use of reinsurance is increasingly common and premium ceded large has been found to be up to 77% [19]. Reinsurance management is marked as the least important activity, in both personal and commercial lines, so it is not surprising that most respondents have not considered DT in this area to date.

Following these changes, strategic partnerships are becoming increasingly important to integrate services, data, and ecosystems. Most respondents agreed that digital technology capability is particularly important when looking at future business partners. Given that large reinsurers have a global presence and support numerous clients [20], [21], they are potentially well placed as informed symbiotic partners, or suppliers, to assist P&C insurers in their DT undertakings. Overall executives seem to agree that DT is not purely an intra-organizational effort but spans the value chain.

D. Future Trends

DT can potentially disrupt classical forms of P&C insurance. Firstly, DT provides new opportunities for distribution where consumers can buy insurance to cover new purchases in the same transaction as their retail purchases [14]. This requires P&C insurers to change from selling insurance directly, to integrating with as many applications as possible. This necessitates many changes in the business structure such as becoming more agile to innovate faster.

Secondly, DT may support the rise of peer-to-peer (P2P) insurance networks. Here, a group of people pools their resources to insure against risks, bypassing the traditional insurer. Although P2P is intended to remove intermediaries, if insurers and intermediaries seize the opportunity, they may be able to create these digital platforms themselves [16]. Given the possible removal or diminish of intermediaries and several other downfalls, it is not surprising that the industry has shown little interest in exploring and implementing true P2P insurance to date [22].

Thirdly, DT is also leading to novel products. Two observed trends are increased personalization and catering for new digital perils. For example, Trov offers

micro-insurance policies (down to the second) billed to customers by the cent for single items by tracking the insured's location [23]. Pay-per-use insurance is a largely unexploited market and requires tight integration with partners. In addition, young customers increasingly demand to do their insurances completely online. As one executive says: "there is growth in client sections that do not want or need traditional insurance products". In terms of maturity, it seems that although ranked as important, the complexities of DT in product development could be the reason that only two of thirteen respondents are at an advanced stage of DT in this area.

Finally, P&C insurers will need fundamental improvements in data quality and management to innovate [24]. Better data enable P&C insurers to rely less on customers' self-reporting. This is especially important in underwriting, where the risk models rely on precise data for calculating the risks and prices. For example, in vehicle-telematics data of the vehicle is collected and used to identify driver behavior and investigate casualties [25]. Steering technologies herein are the Internet of Things, 5G networks, and edge computing. Although industry-wide adoption is deemed slow [26], [27], 61.5% of P&C executives are either busy implementing or are already extracting value from DT in underwriting. In addition, data quality is increasingly becoming a regulatory requirement, with legislation, such as Solvency II and GDPR affecting P&C insurers [28], [29]. This can drive costs up; hence, DT efforts should be done in a cost-effective manner.

There are several reported challenges that companies face. Three executives mention legacy IT-infrastructure as a problem. Additionally, there is employee resistance to change. There is also the question of a clear strategy; what you need to do in a changing world is not easy, as mentioned by six respondents. Five executives mention the difficulty of finding out the real customer needs; DT must find and exploit these.

E. Current DT Maturity

To answer the second research question, our questionnaire asked about the current DT maturity of the P&C insurance industry. From the answers, it is clear that DT impacts every aspect of the P&C insurance value chain. By asking about ranking the importance of each primary value chain activity for DT, we find that underwriting is the most important, followed by marketing, product development, claims management, distribution and policy administration, and finally reinsurance management. By ranking the various value chain activities, it allows us to understand the priorities in the P&C insurance industry and any DT-related actions in context. Furthermore, we asked about the maturity in each of these activities; an overview of the DT maturity in P&C insurers is shown in Fig. 1. Our results indicate that executives are actively making progress in several primary value chain areas except for product development and reinsurance management. The reported DT maturity is relatively high in underwriting, distribution, policy administration, marketing, and claims management.

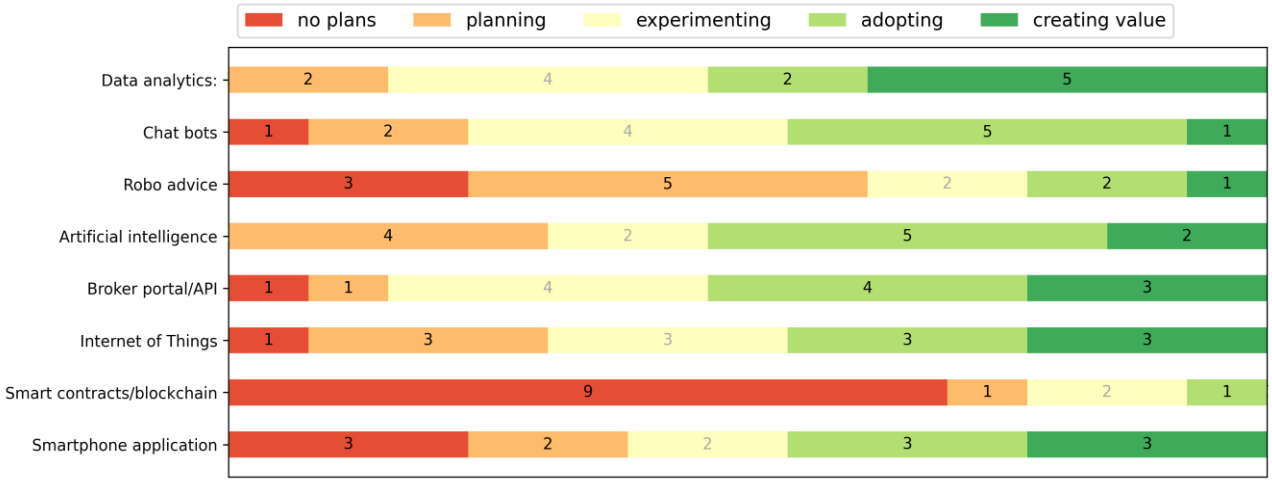

Fig. 2. Emerging technology implementation maturity in the P&C industry.

In addition, we asked our respondents about the implementation maturity of various emerging technologies. Obviously, the maturity of various technology adoptions will vary from organization to organization. Ten respondents (77%) have indicated that their organizations have put in place governance to experiment with new digital technologies. All respondents indicated that they are currently considering emerging technologies, in order of strategic importance: data analytics, artificial intelligence, chatbots, smartphone applications, and APIs. A noteworthy finding is that blockchain and smart contract technologies seem not to be strategic priorities presently. A summary is shown in Fig. 2.

IV. Discussion

In general, the impact of DT on the P&C insurance industry is massive. It is clear that focusing on the IPM measure is no longer a guarantee for future competitiveness. Instead, insurers must look into the changes happening due to DT in the fintech industry, which we outlined above, and adapt accordingly. While substantial effort is being done in most value chain areas and with several novel technologies, as seen in Fig. 1 and Fig. 2, more effort is needed to keep up this momentum. This is a difficult task which requires careful strategizing and planning.

From the questionnaire, it seemed that South African insurers consider DT less important than those from Belgium.

Belgian respondents deemed DT to be of higher importance, more frequently appointed an executive to manage it, and invest more money in DT projects. They also were more convinced of the value of ecosystems. Furthermore, Belgian respondents were more likely to indicate that DT activities were on par with their financial services peers instead of lagging behind as indicated by the South African executives. This might be linked back to the higher rank of Belgium on the 'IMD World Digital Competitiveness Ranking' [7]. It is likely that the discrepancy between these two countries will diminish in the future.

Opportunities exist for fellow scholars to dive deeper into the reasons why these maturity levels are reported, and how to proceed from here. Additionally, more research can be conducted to investigate how different P&C insurers implement the DT initiatives. Other research could further investigate the reason for the reported difference between the countries, as these findings can be useful to better understand DT. Furthermore, practitioners can be informed through our study about the different changes happening in insurance and the reported maturity levels. Our results suggest that P&C insurers are experimenting in various areas, but business opportunities are not yet fully captured.

The main limitations of the quantitative study include the limited sample size and the self-reported responses by executives that might be subject to acquiesce bias. We also rely on the truthfulness of our respondents. Seven respondents indicated that the pandemic has influenced their responses with a handful providing additional responses indicating that the pandemic has forced them to re-evaluate and re-prioritize their DT objectives, which could result in overestimation of their current efforts.

V. Conclusion

In this paper, we contribute to the DT literature by investigating the impact and maturity of DT in the P&C insurance sector, which was academically understudied. Our research has shown that P&C insurance firms consider DT important for their competitive advantage. Most areas of the value chain are being looked at and improved except for product development and reinsurance management. While respondents' digital technology maturity is varied, surprisingly blockchain and smart contract technology is not as mature nor perceived as that importance given the strong indication that the technologies are not currently under consideration. The research findings assist an understanding of DT in the insurance sector, and in turn, can be helpful for further research and practitioners.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Ziboud Van Veldhoven designed the research idea and wrote the final paper; Anas Alaswas, Sean Berrett, and Mark Raymond Robinson performed the initial literature search, designed the questionnaire, and contacted the P&C insurerers; Jan Vanthienen helped throughout the entire process with guidance, tips, and proofreading; all authors have approved the final version.

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