Blockchain technology adoption in the insurance industry: a conceptual framework

Débora Allam-Firley, Elsa Corbin

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Successful blockchain technology adoption in the insurance industry: a conceptual framework

Abstract

The use of new technologies and ubiquitous digitalization have resulted in major changes in customer expectations. The 2019 coronavirus disease crisis has accelerated the need for digital transformation in many industries, including insurance. Insurance organizations recognizing the dynamic changes that are transforming the insurance sector are taking action to gain new competitive advantage by introducing blockchain technology. This technology helps companies to be more customer oriented, improve their offerings, and increase their operational efficiency by enhancing their traditional value chains. The literature on blockchain technology use in the insurance industry has focused on technological aspects, and little is known about the factors underlying the adoption of this technology, which is critical for success. This paper introduces a theoretical model based on the universal theory of acceptance and use of technology for the identification of aspects that can facilitate or hinder blockchain technology adoption in the insurance industry, with the ultimate aim of promoting the successful diffusion of this technology in this sector. This paper contributes to the understanding of insurance employees' perspectives on blockchain technology adoption in their daily work. It identifies aspects of user behaviour that practitioners should consider while developing strategies for blockchain technology implementation in their business processes. The proposed model is conceptual and has not been empirically tested; such research is needed.

Introduction

Digital technologies provide opportunities across all industries throughout the world. These disruptive technologies contribute to changes in companies' business value chains, improving their products, services, and processes (Gault, 2018; Nambisan *et al.*, 2019). The insurance sector is not keeping up with the emergence of digital technologies in their operations management and processes, and the 2019 coronavirus disease (COVID-19) crisis has shifted the implementation of digital transformation strategies in this sector from a strategic option to a necessity (Pauch and Bera, 2022). As in other industries, some insurance companies are involved in digital transformation, with blockchain technology forming the cornerstone of their new business models. Blockchain technology can improve the performance of these companies, changing the design of their value chains (Eckert and Osterrieder, 2020). Its adoption can remove intermediaries such as brokers, who are the faces of insurance for customers (Kar and Navin, 2021). In addition, some companies use blockchain technology as a powerful weapon against fraudulence claims, which still plague the insurance industry, arguing that distributed ledger technology helps to streamline payments and claims handling (Kar and Navin, 2021). The implementation of blockchain technology in insurance organizations' value chains is increasing rapidly (Oberoi and Kansra, 2021; Grima *et al.*, 2020; Crawford *et al.*, 2018).

Blockchain technology has been described as a source of new competitive advantage for insurance companies in the academic literature. However, most research has focused on technological aspects; the adoption of this new technology has not been fully explored (Janssen *et al.*, 2020; Kar and Navin, 2021; Kabir and Islam, 2021). Indeed, the technology is in an innovation

trigger phase; its implementation and thereby adoption are very slow, and the latter plays a crucial role in technology implementation strategies and further technological development. Little attention has been paid to user adoption, although problems with adoption are among the main causes of technology project failure (Hafez *et al.*, 2011). Hence, the aim of this paper is to increase understanding of the potential determinants of blockchain technology adoption in the insurance industry, with a focus on the willingness of insurance company employees to undertake such adoption, using a theoretical framework that draws on the universal theory of acceptance and use of technology (UTAUT). We seek to provide comprehensive answers to the following research question (RQ):

RQ1. What parameters have been identified that can be used to build a theoretical model capturing the willingness of insurance companies to adopt blockchain technology?

The paper is organized as follows. Section 1 introduces the specificities of innovation in insurance services. The implementation of blockchain technology in the insurance industry is described in section 2, and the theoretical framework based on the UTAUT is presented in section 3. In section 4, the conceptual model is discussed and conclusions and research perspectives are provided.

The insurance industry and the emergence of blockchain technology

The insurance industry

Insurance is generally defined as the operation by which a legal person, the insurer, agrees to perform a service (compensation) for the benefit of an individual or organization (the insured) in case of the occurrence of a random event (the risk) against the payment of a given sum (the insurance premium). This reciprocal commitment is defined by the insurance policy. Insurance allows individuals and firms to be resilient and contributes to economic development (Pritchett et al., 1996; Tasca, 2019). It can be characterized as an exchange of money for money and not for a tangible good intended to satisfy an immediate need; it is a specific, complex service positioned at the center of human and financial activities. For a long time, little innovation has occurred in the insurance sector. The fourth industrial revolution and the development of new technology for information and communication (NTIC) have highlighted how digital transformation can improve services and organizations, and insurance is no exception (Schueffel, 2016; Eling and Lehmann, 2018). After highlighting the specificities of the insurance industry, we will characterize innovation and digital transformation therein and examine the possible impacts of blockchain technology, one component of digital transformation, in this industry.

The service industry encompasses a wide range of activities, some of which – such as insurance– are unique. Insurance, a complex business and financial service, is totally intangible; it is distributed in many forms and according to many business models (Rubalcaba et al., 2012; Castellacci, 2008; Ewald, 1991; Allam-Firley, 2021). However, different types of insurance

company share the need to mobilize various actors, including those outside of the firms. Relationships and dynamics between counterparts are more complex and diverse in insurance than in traditional partnerships. Each actor throughout the value chain plays a significant role. Thus, insurance services rely on an ecosystem-based value system (Jacobides et al., 2018). Insurance is also a contract, which means that regulation, liability, and compliance are major issues for this service. It can also be seen as an infrastructural service that relies on network infrastructures (Castellacci, 2008). Finally, insurance is a knowledge-intensive service; from sales to claims, risk management to processing, data are central to insurance activities (Hertog, 2000; Barrett et al., 2015). High-quality information is required to provide a high-quality service and meet increasing regulatory demands (Harrington, 2009; Meier et al., 2021). These features can be observed in the insurance value chain, organizational processes, service delivery, and innovation and output. Innovation spaces can be identified in the insurance value chain.

Innovation and digital technologies in the insurance industry

Insurance and financial services can be considered as process-based archetypes of innovation (Helkkula et al., 2018). Much innovation in insurance focuses on service delivery and use. Moreover, innovation is understood as an activity, rather than an output (Toivonen and Tuominen 2009), and the customer is seen as a participant in the production process, rather than being positioned at the point of output (Lütjen et al., 2019).

Since the 1980s, with the increasing role of services in economies, researchers have established multiple analytical frameworks (centered on, e.g., technology, services, or assimilation) to characterize and understand specific innovation trajectories (Table 1).

Technological taxonomies define insurance as a service that makes extensive use of technology, is based on interactions (Evangelista, 2000), and relies on a network infrastructure (Castellacci, 2008), implying a high degree of interactivity at the organizational level. From a more service-oriented perspective, insurance is a service based on information and the concept of intermediation (Miles, 1987; Howells, 2006). This perspective emphasizes the dual temporality of the insurance service, distinguishing between immediate and expected service provision. Architectural frameworks of the insurance service emphasize the coexistence of several forms and trajectories of innovation.

(table 1)

However, conceived, innovation trajectories enable insurance companies to meet various challenges, such as the intensifying international competitive dynamic that reinforces the demands for differentiation and performance (Yaneva, 2021; Eling and Lehmann, 2018). Insurance performance can be achieved by strong process innovation to improve knowledge and risk management (Paefgen et al., 2014), and it is becoming more important as the variety and intensity of global risks increase (Eling and Lehmann, 2018). In addition, Yan et al. (2018, p. 252) point out that “insurers need to rethink their business models to meet changing consumer expectations and move from a product-centric to a customer-centric approach, leveraging on big data technologies, analytics, and the internet of things.” The access to data provided by NTIC has increased the asymmetry of insurance information. Customers aim to control and be active parts of the process and their relationships with their insurers. To address such issues as a fully immaterial service, information technology (IT) and computer science were used in the very early days to improve insurance processes and services (Barrett et al., 2015; Castellacci, 2008; Hertog, 2000). The digital

transformation that has subsequently been imposed on all industries has had a significant impact on insurance service.

Digital transformation trends in the insurance industry

As insurance is a technology-based industry (Evangelista, 2000), technological change and communication technologies are key to its growth and development. In the post–COVID-19 context, customers and companies require more digitalized insurance services (Babuna et al., 2020). The digital transformation of insurance takes multiple forms, including big data analysis, artificial intelligence (Gupta et al., 2022), the Internet of things (Desyllas and Sako, 2013), cloud computing, and blockchain technology (Tasca, 2019; Yan et al., 2018). It increases cost and performance efficiencies (Bian et al., 2018) and has significant impacts on companies and the whole insurance value chain (Gomber et al., 2018). These impacts are exemplified by the emergence of the InsurTech ecosystem, which embodies innovation and digital transformation and has accelerated the spread of technology in the insurance industry (Yan et al., 2018; Schueffel, 2016; Puschmann, 2017). InsurTech companies rely heavily on technology and knowledge, but this new business model mainly enables the improvement of service delivery according to a technological trajectory. These firms have modernized the value chain by implementing technology at each stage, generating new practices and processes and a new highly technological framework. With this shift, insurance companies and organizations are becoming dematerialized businesses requiring technical expertise. One specificity of the InsurTech system is the high degree of player specialization. Each player focuses on one step of the value chain, developing and promoting a performative vision of the work (Gomber et al., 2018; Milanovic et al., 2021; Stoeckli et al., 2018). In this context, insurance companies tend to outsource all or part of the value chain

to benefit from technological assets and improve service performance and efficiency. Thus, the value chain becomes more fragmented, but more efficient (Gomber et al., 2018; Puschmann, 2017; Schueffel, 2016). For example, the splitting of the "consumption management" step gives rise to several highly digitalized sub-steps (e.g., declaration, fraud detection, payment) in which technology enables service improvement (Chojan et al., 2022).

(table 2)

Blockchain technology in the insurance industry

Among the diverse forms of digital transformation in the insurance sector, blockchain technology has the potential to change or, indeed, completely call into question the current insurance paradigm. Blockchain technology became well known in the cryptocurrency context (Hughes et al., 2019) and is now discussed widely by practitioners and researchers. It is a means of storing and transmitting information in database form, with simultaneous sharing with all users and no dependence on a central entity (Kar and Navin, 2021; Gatteschi et al., 2018). Blockchains make transactions trusted, secure, and decentralized (Beck et al., 2017). These features offer multiple assets to insurance services. Indeed, blockchain technology seems to be a suitable, reliable, and efficient tool that enables insurance to meet industry challenges.

B3i, the first blockchain-centered insurance consortium, was formed in 2016. Blockchain technology confers several benefits for insurance services. The first key benefit is data security (Hughes et al., 2019). From policies to contracts, payment to claims management, actuarial data generation to premium calculation, the whole balance of insurance relies on the quality of data. Moreover, blockchain technology employs public key encryption for all interactions and changes,

which guarantees the integrity and auditability information (Tasca, 2019; Dai and Vasarhelyi, 2017). This feature is particularly important because the insurance business is highly regulated and subject to regular controls. The second benefit is the reduction of the service time requirement via automation (Kar and Navin, 2021). Automation also allows companies to reduce costs, human intervention and error, and paper-based operations. Such cost and time savings improve companies' performance and efficiency (Holub and Johnson, 2018; Hughes et al., 2019). Finally, the blockchain mechanism allows policyholders to manage their personal data (Tasca, 2019), reducing the mistrust that arises due to the information asymmetry that characterizes traditional relationships with insurance companies (Chiappori and Salanie, 2000). Blockchain technology has numerous theoretical and practical applications in the insurance industry, such as for parametric insurance (Shetty et al., 2022), smart contracts (Gatteschi et al., 2018; Hans et al., 2017), fraud prevention, and claims and payment processes (Kar and Navin, 2021; Tasca, 2019). However, blockchain technology applications are currently limited to certain types of insurance and stages of the value chain, due to the maturity of the industry in the face of this technology and the paradigm shifts that blockchain adoption involves (Dai and Vasarhelyi, 2017; Gatteschi et al., 2018).

Conceptual framework and system of relationships

The rapid evolution of digital technologies has deeply altered the processes of technology acceptance and use within and across organizations' operations management. Organizations that would like to use digital technologies to gain competitive advantage by improving operations management activities must understand these processes. Management information systems scholars have developed robust models to aid the understanding of individual attitudes toward

technology and adoption behaviors in organizations (Davis, 1989; Venkatesh *et al.*, 2003, 2012). The present study is based on the widely used UTAUT (Venkatesh *et al.*, 2003), which includes eight individual models and theories: the technology acceptance model (Davis, 1989), theory of reasoned action (Fishbein and Ajzen, 1977), motivational model (Davis *et al.*, 1992), theory of planned behavior (Ajzen, 1991), combined technology acceptance model and theory of planned behavior (Taylor and Todd, 1995), model of personal computer utilization (Thompson *et al.*, 1991), innovation diffusion theory (Moore and Benbasat, 1991), and social cognitive theory (Compeau and Higgins, 1995). The UTAUT is applied mainly in the exploitation stage to examine the willingness of users in organizations (here, insurance companies) to accept the use of new technologies (here, blockchain technologies). The model is used to identify determinants that affect the likelihood of technology adoption (Yi *et al.*, 2006) via the assessment of parameters that predict behavioral intention and expectations (performance expectancy, social influence, facilitating conditions, and functional benefits). These parameters are described, and propositions based thereon are presented in the remainder of this section.

Performance expectancy

Performance expectancy is "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh *et al.*, 2003, p. 447). In other words, people (here, insurance organization employees) will use a technology (here, blockchain technology) if they believe it will have positive outcomes (here, increased productivity and performance) (Mohd Faizal *et al.*, 2022). Performance expectancy thus depends on employees' intention to use and adopt a technology (Alalwan *et al.*, 2017) due to the perception of advantages such as the technology's usefulness in daily work tasks (Davis, 1989; Venkatesh *et al.*, 2012). It

is the strongest predictor of behavioral intention (Baptista and Oliveira, 2015; El-Masri and Tarhini, 2017; Zuiderwijk *et al.*, 2015). With blockchain technology, insurance companies can witness the smoothness of their processes (Sharifinejad *et al.*, 2020), which may increase employees' acceptance motivation. Acceptance is defined as "an antagonism to the term refusal and means the positive decision to use an innovation" (Taherdoost, 2019, p. 1). Thus, we derive the following proposition (P):

P1. Performance expectancy can positively affect the behavioral intention to adopt blockchain technology in the insurance industry.

Social influence

In the context of technology adoption, social influence is "the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh *et al.*, 2003, p. 451). It is impacted at an individual level by the opinions and actions of colleagues, friends, and family members (Irani *et al.*, 2009; Venkatesh and Brown, 2001), and it is a good predictor of technology-related behavioral intention and usage (Venkatesh *et al.*, 2003; Batara *et al.*, 2017; Oliveira *et al.*, 2014; Venkatesh *et al.*, 2012; Alalwan *et al.*, 2017). Social influence has played a key role in technology adoption in sectors such as banking and public government (Martins *et al.*, 2014; Zhang *et al.*, 2018; Weerakkody *et al.*, 2013; Ahmad and Khalid, 2017). In this work, social influence denotes the extent to which insurance professionals believe their colleagues should use blockchain technology. Hence, we suggest the following:

P2. Social influence can positively affect the behavioral intention to adopt blockchain technology in the insurance industry.

Facilitating conditions

Conditions facilitating technology adoption encompass “the degree to which an individual perceives that an organizational and technical infrastructure exists to support use of the system” (Venkatesh *et al.*, 2003, p. 453). They are very important factors in the prediction of user acceptance and usage behavior (Venkatesh *et al.*, 2003, 2012). In this study, they refer to insurance industry employees’ understanding of the resources available in their organizations to support the use of blockchain technology in their work processes (Huang *et al.*, 2012; Oliveira *et al.*, 2014; Sabi *et al.*, 2016). For example, blockchain technology can help insurance company employees combat fraudulent statements (Shetty *et al.*, 2022). Because of its cryptocurrency transaction capabilities, blockchain technology is suitable for any form of immutable information storage, enabling the creation of smart contracts (Eling and Lehmann, 2018; Gatteschi *et al.*, 2018; Grima *et al.*, 2020). Additionally, blockchain technology capabilities are suitable for microinsurance services, insurance on demand, and peer-to-peer insurance (Eling and Lehmann, 2018; Gatteschi *et al.*, 2018). Thus, we propose the following:

P3. Facilitating conditions can positively affect the behavioural intention to adopt blockchain technology in the insurance industry.

Functional benefits

A functional or net benefit is "the effect that an information system…has on an individual which is often measured in terms of organizational performance, perceived usefulness, and effect on work practices" (Petter and McLean, 2009, p. 161). Net benefits such as productivity, increased sales, market efficiency, customer welfare, job creation, and economic development are related to behavioural intention (DeLone and McLean, 2003; Petter *et al.*, 2008). There is room for the insurance sector to reinvent itself with more effective work processes. The adoption of information systems based on blockchain technology has potential benefits throughout the insurance value chain and business processes, such as in the establishment of trust and contribution to future growth (Shetty *et al.*, 2022). Thus, we suggest the following:

P4. Functional benefits can positively affect the behavioral intention to adopt blockchain technology in the insurance industry.

Behavioral intention and expectations

Behavioral intention and expectations encompass "the degree to which a person has formulated conscious plans to perform or not some specified future behaviour" (Warshaw and Davis, 1985, p. 214). Behavioral intentions directly influence (here, blockchain) technology use, whereas a behavioral expectation is the probability that someone (here, an insurance industry employee) will adopt a particular behaviour related to (here, blockchain) technology usage in the future (Ajzen, 1991; Venkatesh *et al.*, 2003; Weerakkody *et al.*, 2013). Hence, behavioral intention affects, and may predict, behavioral expectation (Venkatesh *et al.*, 2008; Maruping *et al.*, 2017). Individuals' behavioral intentions are associated with their internal evaluations of behaviours, and their

behavioral expectation “reflects the strength of the focal behavioral intention over other behavioral intentions” (Venkatesh *et al.*, 2008, p. 486). Thus, we derive the following:

P5. The behavioral intention to adopt blockchain technology can positively affect the behavioral expectation of blockchain technology adoption in the insurance industry.

(figure 1)

Discussion

Theoretical implications

IT-based innovations that combine financial, service, and technological elements are being applied increasingly in the insurance sector. Since the introduction of digital technologies, for instance to guide purchasing decisions, new customer needs and expectations must be met. To be able to deliver value to customers and create new competitive advantage, insurance companies must create new business models. The achievement of competitive advantage depends heavily on the ability to develop new, more customer-oriented insurance products and services (Pauch and Bera, 2022). Blockchain technology is a very important element of technological innovations in the insurance industry, employed actively by several leading insurance firms (e.g., State Farm, Alliance, B3i, and Swiss Re) to design new business models and improve competitive advantage. Many insurance organizations, however, are still in the early stage of blockchain technology adoption for their business processes due to a lack of understanding of how to implement this technology. Recent practitioner-authored articles and consultancy white papers (Oxbow Partners, 2021; Shaw, 2021; Krishnakanthan *et al.*, 2021) describe the potential benefits of blockchain technology implementation in the insurance industry, but research on blockchain technology

adoption behaviour at the individual level in this sector is insufficient. Taking a novel perspective to fill a critical knowledge gap, we propose a conceptual model that could be used to advance current understanding of factors influencing the behavioral intention of insurance industry employees to adopt blockchain technology. This model, based on the propositions made above, provides a pathway for the successful implementation of information systems in general, and blockchain technology, in the insurance industry.

Models of and research on blockchain technology acceptance in insurance companies are very important, as they shed light on strategic tasks and barriers that could impact operations management and, more broadly, the success of digital transformation based on distributed ledger technology. Indeed, possible risks and challenges faced during blockchain technology implementation can alter the odds of an organization's success in this endeavour (Khan *et al.*, 2020). Our model encourages the consideration of blockchain technology design, to avoid bypassing the potential obstacles faced by insurance employees and thereby encouraging the implementation of user-friendly blockchain technology features. Investment in blockchain technology can be expensive, and insurance organizations planning to make such an investment need to be sure that their employees will accept the technology. Our model could contribute to the avoidance of low user acceptance and job satisfaction, blockchain technology project failure, and performance losses. By proposing it, we aim to promote blockchain technology adoption in the insurance industry at a very fundamental level. A better understanding of insurance industry employees' intention to use blockchain technology can help decision makers take appropriate measures to limit resistance and any subsequent effects. Furthermore, an understanding of insurance employees' resistance will help managers to build implementation strategies and achieve better adoption rates.

Managerial implications

The proposed conceptual framework can serve as a reference for insurance organization managers seeking to successfully adopt blockchain technology to consult before initiating implementation procedures. We recommend that practitioners first dismantle barriers related to the adoption of this technology, such as user resistance. Although managers may view blockchain technology as a vital part of their digitalization strategies and their future organizational competitiveness, the neglect of user acceptance and confidence can seriously jeopardize blockchain technology implementation. The recognition of individuals' needs and degree of acceptance is a critical early step for the success of any technology implementation effort in an organization (Taherdoost, 2017, 2018). To reduce risk and facilitate implementation, managers need to know the issues that influence employees' decisions to use and adopt a particular system or new technology (Taherdoost, 2018; Taherdoost *et al.*, 2015). In addition, as for other advanced technologies, insurance organization managers should urge other stakeholders in blockchain technology implementation projects to assess their employees' degree of acceptance before implementation.

Conclusion and further research

The insurance industry is moving toward digital transformation with the use of emerging technologies, and the corresponding transformation of business models will likely result in disruptions and changes in processes, organization and industry structures, and competition (Kar and Navin, 2021). Blockchain technology could play a key role in insurance organizations' acquisition of new competitive advantage, but its real value will be realized only with successful

broad adoption across the industry. Thus, user acceptance, among other issues, cannot be ignored. The proposed model is a novel contribution to the literature on distributed ledger technology in the insurance industry that can be used to identify and leverage the determinants of users' acceptance and adoption of this technology. It can be used by academics and practitioners to guide the development of policies and strategies to meet challenges such as the intention of insurance industry employees to adopt blockchain technology in their everyday activities. The theoretical model, however, needs to be empirically tested. Thus, this paper lays a foundation for future research in the emerging field examining the digital transformation of the insurance industry through the disruptive distributed ledger technology.

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Table 1- Insurance Service Characteristics and Innovation - Synthesis (Allam-Firley, 2021)

Analytical approach of insurance	Focal	Possible innovation paths or forms
Technologist	Insurance is based on information and interactions	Tools for processing information (information systems) and managing interactions (e.g. CRM) will be the main forms of innovation
Service-centric	Insurance is information-based, knowledge is essential	Innovations improve information processing
Economic	Insurance transforms premiums into indemnities, there is a double temporality of service.	Innovations improve the immediate service, the service itself, or both.
Architectural	Insurance is an architectural service, as the service requires the delivery of multiple other services	Innovations of combination and recombination of elementary services. The trajectories can be technological, methodological, service-related, informational, material, relational.

Table 2 - Digitalization of Insurance service (Pauch et Bera, 2022)

Value chain phase	Tools	Impact on insurance
Product design and Development	Big data IoT Blockchain	Data collection and service personalization Product/service innovation Product/service diversification
Insurance risk (assessment)	Big data Artificial intelligence IoT Blockchain Cloud computing	Reduction of information asymmetries Finer risk assessment More possibility of risk prevention Finer segmentation driven by greater processing capabilities More risk appropriate pricing Contract information stored digitally
Sales and Distribution	Big data Cloud computing Artificial Intelligence Social networks Mobile devices Web site and apps	More spread of information to the market Contract information stored digitally Increase in the number of policies purchasable online Increased involvement of the customer in the sales process Innovation and diversification of sales channels
Claims Management	Big data Artificial intelligence Blockchain	More accurate claims assessment Fraud reduction Automated calculation and payout of claims Possibility to claim damages and follow the procedures digitally Decrease of processing time

Figure 1- Determinants of technology adoption, analysis framework