A Mixed Methods Analysis of the Adoption and Diffusion of Chatbot Technology in the German Insurance Sector

Completed Research

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Abstract

In recent years, gradual improvements in information, computing, communication and connectivity technologies have enabled new technical possibilities for the adoption of Chatbots across diverse sectors. In the case of the insurance sector, the implementation of service innovations based on Chatbot technology can contribute, among other benefits, to improve the efficiency across the insurance value chain, reduce costs and generate customer loyalty and trust (Barrett et al., 2015; Ross et al., 2016). However, despite the advantages, the adoption success of Chatbot Technology depends on the understanding of the ambivalent perceptions, attitudes, and beliefs of the main social actors (i.e. practitioners and potential users) towards the customer interface. Using a mixed methods design based on an interpretive paradigm and within the frameworks of acceptance and diffusion research, we identified the "relative advantages" and "IS infrastructure" as the most critical ambivalent socio-technical factors for the adoption and diffusion of Chatbot technology in Germany.

Keywords

Acceptance and Diffusion Research, Ambivalent IT, Technology, Organization, Environment (TOE) Model

Introduction

In the last decade the rapid diffusion of technological innovations enabled by the aggregated disruptive power of clusters of information, computing, communication and connectivity technologies known as Social, Mobile, Analytics, Cloud, and Internet of Things (SMACIT) technologies and advances in the field of artificial intelligence (AI) had fundamentally challenged the way in which traditional insurance service providers generate business and economic value (Schuelke-Leech, 2018).

In a manner comparable with the FinTech companies in the banking sector, diverse Insurtech companies are disrupting the insurance industry. The term Insurtech is a neologism resulting from the words 'insurance' and 'technology', and refers to financial technology start-ups which offer technical, customer-oriented and insurance-related innovations (Stoeckli & Uebernickel, 2018). In order to be able to respond to the progressively competitive environment and meet the needs and expectations of increasingly digitally influenced customers, the traditional insurance service providers are compelled to undertake a profound digital transformation of their value chain processes, which, in turn, implies also a restructuring of their traditional business models and an strategic realignment of the way in which they engage with their customers by means of service innovation (Barrett et al., 2015).

In the specific case of the insurance sector, the implementation of technological innovations in the form of Conversational Systems (i.e. Chatbots) can contribute to unlocking new solutions and business opportunities if the aforementioned systems are properly integrated into the traditional value chain of

insurance service providers by means of long-term digital strategies based on customer engagement and digital solutions (Ross et al., 2016). In this way, through the implementation of Chatbots at the customer interface, incumbent insurers could compress the prevalent multi-channel approach into one "seamless, omni-channel experience so that customers can order, inquire, pay, and receive support in a consistent way from any channel at any time" as endorsed by Ross et al. (2016). Accordingly, the adoption of Chatbots could improve the efficiency across the insurance value chain, reduce costs, increased the accessibility for customers and generate loyalty and trust (Barrett et al., 2015; Ross et al., 2016).

In recent years, gradual improvements in AI, social media and computer parsing technologies have enabled new technical possibilities for the adoption of Chatbots across diverse sectors such as healthcare, tourism and education (Winkler & Söllner, 2018). However in the insurance sector, despite the high rates of intended adoption among insurance companies, the effective adoption rates remain low. For instance, in a survey of 85 surveyed German insurance companies, 44% of them wanted to invest more in Chatbots in 2018, but only 7% of them actually implemented digital assistants by 2017 (Branchenkompass Insurance, 2017). As a point of comparison, online retail, telecommunications, manufacturing and high-tech engineering companies reported in a survey an intended Chatbot adoption rate of 45% by 2020 with already an effective adoption of 31% by 2016 (Oracle Corporation, 2016). Although the levels of Chatbot adoption support are similar across industries, the adoption gap between the intended and actual adoption in the insurance industry indicates the existence of an ambivalent system-determined or market-determined position (i.e. perceptions, attitudes and beliefs) to change the status quo (van Offenbeek et al., 2013) that must be examined in order to fully understand the cost-benefit dynamics behind the adoption of Chatbots in an insurance context. Nonetheless, there is a lack of studies that provide theoretical knowledge or systematic evidence about the underlying cognitive, affective and behavioral mechanisms driving Chatbot technology adoption. Given the above, this paper aims to provide socio-technical insights on the ambivalent factors influencing the adoption and diffusion of Chatbots in the insurance sector, using the German insurance market as social context and specific area of inquiry. Hence, by means of a mixed methods design based on an interpretive paradigm and within the frameworks of acceptance and diffusion research, we address the following research question:

RQ1: Which socio-technical factors influence (positively or negatively) the adoption and diffusion of Chatbot technology in the insurance sector?

Theoretical Background

The term Chatbot is a neologism which originates from the words 'Chat' and 'Bot' to describe a text-to-text, text-to-speech, speech-to-text or speech-to-speech conversational interaction in real-time between a human and a software robot (Schumaker et al., 2007; Puschmann, 2017). Accordingly, a Chatbot can be defined as a conversational software interface or a computer-based dialog system in which, depending on their degree of sophistication and design, a conversational interaction can be built on a decision-tree logic or can be activated through sophisticated natural language (NL) queries (Shawar & Atwell, 2005; Hirsch, 2017). In the first type of conversational interaction design, the system uses a miscellaneous algorithm of rule-based pattern matching to identify keywords in the input phrasing and return from a database the most related wording pattern as an answer (Lucente, 2002; Schumaker & Chen, 2010). While in the second type of conversational interaction design, the systems can use either Machine Learning (ML) or Deep Learning (DL) to operationalize the structure of the input phrasing and improve the quality of their output responses by learning from previous conversational interactions (Shabariram et al., 2017). This form of conversational agents, known as Artificial Intelligence (AI) Chatbots, are able to provide knowledge-based recommendations to support humans in making complex choices and can show human-like traits such as rationality, autonomy or environmental perception (Nunamaker et al., 2011).

The introduction of Chatbot technology started in 1966 with the computer program known as ELIZA, a virtual psychotherapist based on a simple rule-based keyword matching. In recent years, gradual improvements in information, computing, communication and connectivity technologies have enabled new technical possibilities for the adoption of Chatbots across diverse sectors such as healthcare, tourism and education (Winkler & Söllner, 2018). In the insurance sector, the primary signs of the adoption and diffusion of Chatbot technology can be observed in the German market through the implementation of the ARAG travel insurance Chatbot (ARAG, 2019) and the Allianz Job assistant Chatbot (Allianz SE, 2017), both of them using Facebook as a platform to run. Similarly, some German Insurtechs such as the German

Insurtech Insurgram in cooperation with ERGO Direkt have tried to implement an insurance Chatbot, nevertheless the pilot phase of this joint project could not be overcome (Nannt & Ermacora, 2016).

In order to determine to which extent the subject field of Chatbots is already established in the scientific literature of the academic fields of Information Systems (IS), Technology, Innovation and Entrepreneurship (TIE), Banking and Finance (BA-FI) and Insurance, an explorative literature review based on Webster and Watson (2002) was carried out targeting scientific papers published in English or German language in high quality academic journals or Conference Proceedings (i.e. VHB journal ranking from A+ to C of the Verband der Hochschullehrer für Betriebswirtschaft e.V., 2019). The terms "Chatbot", "dialog system", "computer-user communication" and "conversational robot" were chosen as search terms in the databases EBSCO Business Source Premier and ProQuest (ABI/Inform). As a result, a total of 11 relevant scientific peer-reviewed scientific articles were identified (IS, n=10; BA-FI, n=1). From this final set of scientific literature, those academic articles published between 2000 to 2011 in scientific journals and conferences proceedings in the field of IS show a preponderant focus on the historical development of Chatbots and the design and deployment of the first application cases of conversational agents (e.g. Weizenbaum & Joseph, 1966; Maes & Pattie, 1995; Cassell, 2000). On the other hand, more recently published scientific papers are focused on the study of the technical challenges of Chatbot technology (e.g. Schumaker et al., 2007), security considerations (e.g. Ferrara et al., 2016), data analytics and the development of artificial intelligence (e.g. Dillenberger et al., 2011) and the deployment of application cases in e-commerce (e.g. Vinodhini & Chandrasekaran, 2016), accounting (e.g. Dilla, 2013) and internal communication processes (Saenz et al., 2017). With regard to Chatbot technology acceptance research, only the study of Lucente (2002) had examined the factors influencing the adoption of Chatbots in the context of e-commerce. To the best of our knowledge, so far no study has yet evaluated the acceptance and diffusion determinants for Chatbot technology in an insurance context or provided theoretical insights for the specific-context of Germany.

Although some scientific papers have examined the factors influencing the adoption of Chatbots from the perspective of e-commerce, as indicated by van Offenbeek et al. (2013), technology, and therefore also its patterns of adoption (e.g. the perceived value and risks related to the implementation and use), are context-specific. For this reason, the findings of similar IS adoption studies conducted in contexts other than insurance may not be transferable to the insurance field. In this way, the adoption patterns of insurance Chatbots would be different from the other AI-based dialog systems, since the affective and behavioral reactions of the potential users towards the adoption of Chatbots in a highly conservative and regulated context would tend to change ambivalently in proportion to the perceived advantages and the degree of perceived financial, social and privacy risks concerns. These risk concerns are normally channeled through high levels of human interaction in an analog insurance value chain, however in a digitalized customer interface, the successful adoption of Chatbots would rely to a large extent upon the ability of the dialog systems to digitalize the human capacity to build trust by imitating the linguistic communication in human-agent interactions through natural language processing (NLP).

Theoretical Models for Acceptance and Diffusion Research

A deeper insight into the mechanisms underlying the adoption of Chatbots in an insurance context can be obtained through the theoretical knowledge accumulated on acceptance and diffusion research. In the IS scientific literature, the distinction between acceptance, adoption and diffusion is often blurred (De Vries et al., 2018). As described by van Offenbeek et al. (2013), most IS adoption theories are focused on acceptance as underlying notion to explain the behavior towards an innovation at the individual level. However, De Vries et al. (2018) identified by means of a meta-analysis that 70% of the scientific publications on innovation diffusion and adoption included in their examination failed to provide a distinction between the concepts of adoption and diffusion. To address this issue, Bui (2015) elucidates that adoption and diffusion allude to the implementation of an innovation at different perspectives or levels of analysis. Consistent with this categorization, the term of adoption refers to the implementation of an innovation at the individual or micro perspective (i.e. user level), while the term diffusion relates to the dissemination of an innovation at a macro perspective (i.e. within a social system, market or industry). In the scientific literature the area of research concentrated on the study of the individual behavior towards innovative technologies is called technology acceptance research or, in a more general definition, acceptance research (van Offenbeek et al., 2013). Burton-Jones and Straub (2006) define acceptance as "a user's employment of a system to perform a task". According to van Offenbeek et al. (2013) three type of factors determine the decision of a user to employ a system: 1) what the user thinks (knowledge factors), 2) what the user feels

(affective factors) and, 3) the user's actual or intended use (behavioral factors). The former factors, in turn, shape the perceptions, attitudes and beliefs determining the decision to adopt innovations (Khan, 2018).

At the individual or user level, the most commonly used theoretical model by IS acceptance researchers for identifying the factors that act as key drivers for the acceptance of innovations is the "Technology Acceptance Model" (TAM) of Davis, Bagozzi and Warshaw (1989). In line with the social psychology-based Theory of Reasoned Action (TRA) of Fishbein and Ajzen (1975) and Ajzen and Fishbein (1980), the fundamental assumption behind this acceptance model is that the "perceived usefulness" (PU) and the "perceived ease of use" (PEOU) of a technology are the two decisive internal beliefs determining the consumers' technology acceptance. Over time, TAM has been continuously expanded to increase its explanatory power (e.g. Venkatesh & Bala, 2008).

At the organizational level, the 'Technology, Organization, Environment (TOE) Model" proposed by Tornatzky et al. (1990) joints the theoretical constructs of the Diffusion of Innovation (DOI) theory of Rogers (2003), the Theory of Planned Behavior (TPB) of Ajzen (1991) and the TAM in a structural framework which allows to determine the factors influencing the adoption of IS innovations at a technological, organizational and an environmental levels of analysis. Since this paper aims to contribute to the understanding of the ambivalent adoption factors of Chatbots in the context of insurance, we adopted the TOE theoretical framework to provide a holistic view of the factors related to both the user acceptance and organizational adoption. This approach enables us to identify the potential sources of ambivalence (e.g. unit of adoption, cognitive, affective and behavioral components, among others) and its possible relationships with the characteristics of the underlying internal and external technologies (technological level), the IT and human resources available to support the adoption process (organizational) and contextual-factors related to the market and stakeholders (environmental).

Methodology and Results

Since the aim of this paper is to provide socio-technical insights on the factors that influence, either positively or negatively, the adoption and diffusion of Chatbot technology in the insurance sector. Our study follows a mixed methods design based on an interpretive paradigm to contextualize the knowledge, perceptions, attitudes, and beliefs of the main social actors (i.e. practitioners and potential users) towards the acceptance and potential diffusion of Chatbot technology within the insurance industry (Gregor, 2006). The mixed-methods approach of this analysis follows a sequential exploratory design (Wu, 2012), which conjoined a dominant qualitative phase characterized by the implementation of semi-structured expert interviews with a complementary quantitative phase where a web-based cross sectional survey was performed (Tunarosa & Glynn, 2017). The main methodological characteristics of this qualitative and quantitative phases are described below:

Qualitative Approach: Semi-Structured Expert Interviews

The qualitative approach uses the German insurance market as social context and specific area of inquiry for conceptually modeling the ambivalent perceptions, attitudes and beliefs of the experts towards the potential implementation of Chatbot technology in the insurance market. To achieve the above, we conducted seven (N=7) semi-structured expert interviews with senior executives of insurance companies (n=3), Insurance Advisory Partners (Leaders of special teams related to digital transformation or digital services) from consulting firms (n=2) and founders of Chatbot start-ups (n=2) located in Germany. The interview guideline used for conducting the face-to-face semi-structure interviews was divided into the thematic sections of current challenges of the insurance sector, digital disruption and potential diffusion of Chatbots technology in the insurance sector. The analysis of the questions took place with the transcription of the interviews and have been further evaluated in line with the inductive classification framework of Greener (2008), using the following three levels of analysis based on the TOE framework of Hameed and Arachchilage (2017): (C1), Technological Level, (C2) Organizational Level, (C3) Organizational Level and (C4) User Level. In order to obtain a more in-depth analysis through the theoretical lens of the most representative adoption and diffusion theories, we used an axial coding technique based on the theoretical constructs identified in Table 1. Both, the codification process and the content analysis of the interview transcript, were performed using MAXQDA 2018.

Level of Analysis	Construct/ (Model, Theory)	Description (Source)
Technological Level (DOI Theory)	Relative Advantages	"Degree to which an innovation is perceived as better than the idea it supersedes" (Rogers, 2003)
	Compatibility	"Degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 2003)
	Complexity	"Degree to which an innovation is perceived as difficult to understand and use" (Rogers, 2003)
	Trialability	"Degree to which an innovation may be experimented with on a limited basis" (Rogers, 2003)
	Observability	"Degree to which the results of an innovation are visible to others" (Rogers, 2003)
Organizational Level (TOE Model)	Top Management Support	"Extent of commitment of resource and support from the top management to the innovation" (Hameed et al., 2012b)
	IS infrastructure	"Availability of IT resources within the organization for the adoption" (Hameed et al., 2012b)
	Costs	"Costs of an innovation's implementation" (De Vries et al., 2018)
Environmental Level (TOE Model)	Environmental threats	"Government Regulations, constrains in external funding, information or knowledge" (Pichlak, 2016)
	Competitive Pressure	"Frequent competition between organizations/states" (De Vries et al., 2018)
	Collaborative Networks	"Synergy of e-business with traditional businesses" (Hameed & Arachchilage, 2017)
User Level (TAM)	Perceived usefulness	"Degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989)
	Perceived Ease of Use	"Degree to which a person believes that using a particular system would be free of effort" (Davis, 1989)
	Perceived Behavioral Control	"Subjective estimation of the anticipated obstacles related to performing a particular behavior" (Ajzen, 1991).

Table 1. Conceptual Framework for Adoption and Diffusion Analysis based on (Hameed & Arachchilage, 2017)

Summary Content Analysis

The experts mentioned as current challenges of the insurance sector, the interplay of demographic changes and low-interest levels, increasing regulatory frameworks, new customer expectations and new market competitors. With respect to the subject of competitive pressure, at the moment, the experts consider that Insurtech companies do not have the power to have a disruptive impact on the insurance industry. For instance, without BaFin licenses Insurtech companies cannot sell insurance products and have to cooperate with insurance companies. However, this regulatory barriers to entry are beginning to fall. The experts pertaining to the InsurTech scene consider that the traditional Insurance companies are under estimating the competitive risk. In general the interviewees mentioned that the technology underlying Chatbots need to progress more to be technically capable to support a complete insurance process by itself. At the present time, the experts are not sure that the benefit of adopting Chatbot technology will be economically rentable.

Quantitative Approach: Web-based Cross Sectional Survey

To shape methodically the user acceptance characteristics (i.e. knowledge, attitude and behavioral intention) of potential users relating to the adoption of Chatbots into the German insurance market, a mixed-mode survey of self-administered data collection has been performed using online professional networking sites, student platforms, electronic mail and the online portal of Surveymonkey.com as collection modes (Klassen & Jacobs, 2001). For topics that are strongly related to the Internet, as it is the case of Chatbot technology, the method of a written survey via internet is particularly suitable since a vast majority of people can be reached (Hanson et al., 2005). The main methodological characteristics of the survey are described below:

Since the analysis of this paper has been restricted to Germany, the sample selection is also limited to this region and therefore the survey was designed in German language.[1] The survey instrument comprised closed questions varying between single-choice and multiple-choice. The field phase of the online survey lasted about ten weeks. In the given period, a number of 363 participants could be reached. After adjustments of unclear answers as well as the sorting of dropouts, the sample number was set to N= 300. This corresponds to a response rate of 82.64 percent. There was no restriction in age, since a secondary objective of the survey consists in revealing possible differences in user acceptance characteristics among different generations. For that reason, the sample number was divided into four cohorts or generations (Williams et al., 2010): Baby Boomers: 34 participants (cohort born between 1946-1964 and aged from 73 to 55 years), Generation X: 39 participants (cohort born between 1965-1976 and aged from 54 to 43 years), Generation Y: 199 participants (cohort born between 1977-1994 and aged from 42 to 25 years), and Generation Z: 73 participants (cohort born after 1995 and aged under 23 years).

The first part of the survey aims to determine the extent to which potential users are aware of the existence of Chatbot technology and comprehend its functioning in a general manner. In order to posteriorly clarify the relationships between the user acceptance characteristics of knowledge, attitude and behavioral intention towards insurance Chatbots, this first part of the survey has been classified as "knowledge". The results of the survey in this regard, indicate that at the aggregate level only 51 percent of the respondents are familiar with Chatbot technology. At a more detailed level, the analysis per cohort shows that only 35.4 percent of the Baby Boomers, 46.2 percent of the Generation X, 52.8 percent of Generation Y and 60.71 percent of the Generation Z are aware of the existence of Chatbot technology and are familiar with the term.

The second part of the survey evaluates the preferences of the potential users concerning the adoption or rejection of Chatbots at different stages of the insurance advisory process (e.g. in the first steps of the advisory process in order to collect information, during the entire consultation process or even a consultation process without Chatbots), therefore it has been categorized as “attitude”. The results show that 47 percent of the respondents prefer the use of Chatbots at the beginning of the advisory process, 13 percent would prefer to be advised more closely by a Chatbot in insurance questions during the entire consultation process, 7 percent of the respondents would be willing to sign up an insurance policy by means of Chatbots. Nevertheless, still 33 per cent of the respondents reject the adoption of Chatbots in insurance advisory. While the results indicate that the use of Chatbots in the initial introduction of the consultation is accepted by a major part of the questioned participants, the willingness of using Chatbots within an insurance context depends largely on the age of the user. The majority of certain age groups is not willing to interact with Chatbots at any point of the insurance advisory process. For example, 52.9 percent of the respondents belonging to the Baby Boomers cohort and are not willing to interact with Chatbots while this value is below 40 percent through all other generations. The same age effect can be seen in the analysis whether Chatbots should be used in the first steps of the advisory process, since only 23.5 percent of the Baby Boomers could conceive the adoption of a Chatbot in the first steps of the consultation process, while in contrast the acceptance in all other age groups is around 50 percent.

The last part of the survey related to the determination of the behavioral intention of Chatbot technology adoption depending on the diverse service delivery channels has been categorized under the term “behavior”. At an aggregate level, the majority of the respondents (61 percent) would prefer to communicate with a Chatbot via official media (i.e. the website of the insurance product or insurance service provider). While to a lesser extent, some of the respondents would be willing to receive advice on insurance products

[1] The questionnaire used to collect the primary data is available upon request.

and services via mass media channels such as messengers (13 percent) and Facebook pages (7 per cent). On the contrary, merely 20 percent of the respondents would not be willing to accept the support of Chatbots in insurance issues by any medium. The strong preference of the respondents for official media as favored interaction channel for the service delivery is in contrast, however, to the actual mass media design of the service delivery in insurance Chatbots, since as mentioned before, the German insurance companies already using the Chatbot technology run their Chatbots via the Facebook messenger platform. At the cohort level, it is possible to identify that the Baby Boomers and the generation X, with a rejection rate of 26.5 and 18 percent respectively, are by far the age groups with the lowest behavioral intention to adopt Chatbots within an insurance context. Furthermore, the majority of the baby boomers (64.7 percent) as well as the majority of generation X (69.2 per cent) who would be willing to use insurance Chatbots, prefer the serviced delivery and interaction via official media. In contrast to the older age groups, a smaller percentage of the Generation Z (21.4 percent) prefers communication via official media. Respondents are more inclined on the usage of a Messenger (53.8 percent). The obtained primary quantitative data summarized in the terms knowledge, attitude and behavior have been analyzed using the Pearson correlation. The Pearson correlation coefficient is defined as a measurement of strength as well as direction of a linear relationship between two variables, explaining the direction and degree to which one variable is linearly related to another (Bolboacă and Jäntschi, 2006). For the analysis, the statistical package SPSS has been used. The analysis yields to a correlation of $r = 0.848$ between the terms attitude and knowledge and a correlation of $r = 0.810$ between attitude and behavior. The analyzed results indicate that there is a stronger linear dependence between the derived terms and therefore the answers of the respondents regarding the question, whether they know the term Chatbot and the preferred channel to communicate with Chatbots as well as the question which deals with the desired state of use of Chatbots within the advisory process. The correlation between knowledge and behavior leads to a value of $r = 0.621$, which indicates a weaker dependence between those terms. In line with the descriptive analysis of the survey, the strength of linear relationship between the analyzed terms shows a dependence on the level of knowledge regarding Chatbots and the desired communication channel as well as the preferred state of Chatbots usage within the advisory process.

Discussion and Integrative Analysis

At the **technological level**, the analysis of the qualitative data obtained by means of the aforementioned expert interviews indicate a **low level of trust** in Chatbot technology since it is not matured enough to process important insurance decisions without human beings. According to the experts, especially in processes involving a higher level of perceived financial, psychological and privacy risks (e.g. health and life insurance services and products), **resistance to change** is expected to be manifested with more intensity as a result of a **low compatibility** with the prevalent technical (i.e. quality of the deployment of AI in Chatbot applications) and social (i.e. Demographic trends) environment. On the other hand, most of the interviewees, mentioned that, as a result of the increasing trend for 24/7 access propagated by online-shopping providers, the customers perceive a **relative advantage** over the traditional human-agent model of the insurance services in the possibility to get products and information quickly, easily and without any time and access restrictions. Nevertheless, more than the half of the interviewees were pessimistic about the potential acceptance of Chatbots in the Insurance sector because, as one interviewee stated: *"Germans are skeptical about Chatbots"*. Based on our qualitative analysis, 60% of the codified statements illustrating the beliefs of the interviewees about the **technological complexity** associated with the use of Chatbots were categorized as negative. In reference to this point, another interviewee mentioned that *"The state of development of the Chatbots, which can be found on some internet pages, is deficient and disadvantageous for the acceptance of Chatbot technology"*. At the individual level, the forgoing implies that the **trialability** and **observability** of Chatbots, in applications contexts not directly related to the insurance sector, have had a negative impact on the perception of the **ease of use** of Chatbots, which in turn has consolidated itself into an adverse attitude towards Chatbot technology as a result of negative use experiences attributed to shortcomings in the state-of-the-art deployment of artificial intelligence, human language technologies (HLT), semantics, and built-in speech recognition in Chatbot applications.

At the **organizational level**, when asked about the insurance context in which Chatbot adoption can enhance the value chain of the insurance sector, the interviewees stated that provided that the Chatbot complies with the **cost and quality standards**, the application could be established in the area of service at the customer interface where Chatbots could assume the first steps in customer contacting or support. In general terms, experts see the use of Chatbots mainly in service at the customer interface and in the case

of simple mass consultations in the area of claims. The survey also found a higher acceptance in these two areas. The outcome of the survey outcome also found that customers are also willing to acquire insurance for commodity products via Chatbots. However, the interviewees do not envisage the use of Chatbots in complicated tasks. As well, interviewees do not believe that there is a general interest from their clients to execute a complete transaction of an insurance advisory via Chatbots. According to some of the interviewed experts, the implementation of Chatbots in specific smaller divisions can be implemented in a period of five to seven years but other interviewees specify that the adoption depends more on the development of the underlying technology **(from neutral to passive management support**). Nevertheless, their development can help to increase customer satisfaction in the insurance advisory and to arouse interest in the unattractive field of insurance products, especially for younger people. Main focus of insurers should be to increase the development of their own **IS infrastructure**. Because only if in the back-end the systems can deliver and transform data as well as information, the front-end application can be fed with the right content and operate correctly.

At the **environmental level**, all interviewees identified as **environmental threats** the interplay of demographic changes (i.e. the rapid ageing of the German population), the persistent low levels of interest rates, increased regulatory frameworks and **market pressures** (new customer expectations and new market competitors, in form of InsurTech companies). From these, the demographic change is the environmental pressure that the interviewees believe that will have the most significant impact on the adoption and diffusion of Chatbot technology in the insurance context given that impact that it has on the perception of financial risk among the customers. They believe that the acceptance level of the customers will vary with their age, and that especially those customers between the ages of 40 and 60 years, will be willing to be served digitally by means of a Chatbot. One of the interviewees notes that in the consulting firms, the adoption of Chatbots could help in 15 years to cope with future workforce shortages due to demographic developments. Therefore, if an insurance company wants to implement Chatbots it must be taken into account that insurance products are different from other consumer goods. Taking into account the insights obtained through the performance of the web-based cross sectional survey, in general it could be identified that independent of the generational cohort, the acceptance of Chatbots is cautious in the field of insurance advisory and the process of implementation the technology should not be rushed. Nevertheless, the participants of the survey noticed several advantages of Chatbots such as rapid and objective responses. Further, the issue that the user does not have to pay attention to the state of mind of the interlocutor and there quality of the responses is no dependent on the mood of the other person was evaluated as positive.

Concluding Remarks and outlook

The objective of this paper was provide socio-technical insights on the factors that influence the adoption and diffusion of Chatbot technology in the insurance sector, using the German insurance market as social context and specific area of inquiry. By means of a mixed methods design our analysis found that both practitioners and potential customers indicate that the level of trust in Chatbot technology is not yet enough to process important or complex insurance decisions without the support of a human being. Both practitioners and potential customers prefer a hybrid customer interface. We identified the "relative advantages" and "IS infrastructure" as the most critical ambivalent positive and negative socio-technical factors for the adoption and diffusion of Chatbot technology in Germany. This is because, while traditional service providers and customers can perceive the advantages of the adoption of Chatbots in specific areas of the value chain, the incumbent insurers revealed difficulties to integrate the technology into their heterogeneous legacy systems and IT structure. Consistent with the earlier points, future research should analyzed in greater depth the socio-psychological factors involved in the perception of financial, psychological and privacy risks related to the use of Chatbots. For the time being, as can be seen from the results of the survey, there is a lack of trust in the technology behind Chatbots (i.e. artificial intelligence). Similarly, future research can make use of Information economics theory in order to analyze how the information provided by the Chatbot affects the purchase decision of the potential customers.

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