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RESEARCH ARTICLE

HEALTH INSURANCE AND HUMANOID ROBOT-AGENTS: A CASE STUDY

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ABSTRACT

The Sustainable Development Goal (SDG) Target 3.8 has emphasized the persistence of health risks as a major challenge for emerging and developing countries. This challenge necessitates the achievement of Universal Health Coverage (UHC) by enhancing the infrastructure of the public sector. However, relying solely on public sector healthcare may not be sufficient to meet the needs of large populations, particularly in underdeveloped regions. Consequently, private sector healthcare solutions have emerged to fill service gaps, but they remain unaffordable for many low-income individuals. To the end, Health insurance can play a crucial role in making these services more accessible and affordable, but it faces several challenges including poor accessibility, low awareness, lack of skilled workforce, and corruption.

The integration of Artificial Intelligence (AI) and Machine Learning (ML) technologies can offer solutions to these challenges. However, the adoption of technology in the insurance domain poses behavioral challenges that must be identified and addressed. This is particularly important in developing and emerging countries where markets are still underdeveloped, and information asymmetries are high. This study examines some of these challenges by studying people's attitude towards humanoid agents. For this study a case study approach has ben used. Overall, addressing the challenges of health insurance and incorporating advanced technologies can provide a vital safety net against health risks to people.

KEYWORDS

health expenditure, rising inflation, robot advisors, health insurance value chain.

INTRODUCTION

After COVID-19, spending on health-related products has significantly increased [1]. Reports show that the global spending on health in 2020 was $USD9 trillion, which represented 10.8% of the global gross domestic product (GDP) [22]. For lower and middle-income group countries, this figure is even higher [22]. This unusual increase in health spending during the pandemic reinforces the need to focus on the macroeconomic uncertainty that arises due to health risks. Health financing is a crucial policy area that is often underutilized despite the abundance of literature available. Among the different options available for health financing, insurance products and services have garnered attention, and governments have been promoting them. However, the high cost of health insurance remains a significant challenge that limits the effectiveness of these products for the public.

Studies have identified market inefficiencies as the main cause of high health insurance costs, which stem from inadequate information exchange [5,2,7,9]. To capture the customer information, the products may be made or updated several times in response to changes in the risk profile of the insured. However, to control costs, risk profiling of individuals remains static most of the time, in the sense that firms take data only at the time of underwriting the health insurance product [2, 3]. But this, in turn, increases the claim ratio, and the overall cost of health insurance products goes up [1, 4, 5]. Furthermore, this mechanism does not enable consumers to fully decipher the information pertaining to the product.

Similarly, there are several other instances of trade-offs between cost and value due to inadequate information exchange between buyer and seller. Therefore, health insurers must ascertain how to deliver both value and quality. To do so, firms have been employing advance IT-enabled solutions and employing them at various stages of the insurance value chain [6–8]. The level of technology integration is rising every year. McKinsey & Company predicts that by 2025, 25% of insurance activities will be automated through AI and machine learning [3, 4, 7]. They claim that evolving technologies are transforming the health insurance industry on several fronts, starting from demonstrating the complex terms and conditions to insurance clients to collecting the real time data on risk behaviour of individuals [5]. Moreover, in recent few years, several AI driven apps such as chat-bots, instant call patch for tele-medicals, video-based verification in regional languages, personalized customer care services have grabbed significant portions of insurance business operations [11].

Despite favorable industry reports , some studies express reluctance and highlight the lack of human touch associated with these technologies. However, recent developments such as the creation of Chat-GPT - an AI-based program designed to simulate human-like conversation - challenge this argument to a great extent. In light of these developments, we are interested in exploring the feasibility of humanoid insurance agents, which are physical robots designed to interact with customers in person. While there has been some discussion of this concept in the existing literature, little attention has been given to its potential application in the health insurance domain [5, 9]

The health insurance industry is a highly knowledge-intensive field, requiring agents to invest significant amounts of time and effort to gain a thorough understanding of the complex products they offer. These products involve the integration of information from three distinct fields: medicine, finance, and law, making it a challenging area to master. Therefore, leveraging robotic technologies to simplify and integrate information can enhance the provision of customized services, which is crucial in facilitating the sale of health insurance products. The role of such technologies becomes even more critical in light of the intricate nature of these products, market imperfection, and low affordability of people after the recent pandemic [6,10]. In the insurance domain, most of market imperfection arises when there is an asymmetry of information between the sellers and buyers of a product, meaning that one party has access to more or better information about the product than the other. The role of insurance agents is critical in bridging the information gap. However, in developing and emerging countries, the shortage of trained agents poses a significant challenge, as it hampers a firms ability to perform this crucial function effectively. Moreover, these countries face poor demand for health insurance products. This creates two-way pressure on firms [16, 7].

In this regard, the closest industry from which insurers can learn is the healthcare industry. Hospitals, in particular, have long struggled with the challenge of finding good doctors. To address this issue, the healthcare industry has increasingly turned to devices equipped with Artificial Intelligence (AI) to improve the quality of health care [11].

Overall, AI technologies have the potential to bring significant benefits to society and can be leveraged in various ways to improve people's lives. However, implementing new technologies can be challenging and sometimes riskier. Therefore, it is important to exercise due care. To address this issue, the current study employs technology diffusion theory [21] and aims to understand how people would respond to a hypothetical scenario in which firms adopt humanoid agents to minimize the information gap in the health insurance domain, replacing traditional agents. Technology diffusion theory provides a framework for examining the various factors that influence technology adoption and diffusion in any organization and society. These include relative advantage of new technology over existing ones, its compatibility with existing systems, its complexity, the level of trialability and observability, and the behavioral and social norms and

values of the society organization and its members [4, 5]. However, in the current work, we are interested in identifying behavioral and social norms.

RESEARCH GAP AND THE STUDY QUESTION:

Previously, several authors have explored the feasibility of integrating Information and Communication Technology (ICT) enabled devices in the insurance industry from the different theoretical perspectives. Some of them highlight the contradictory behaviour of ICT adopters and insurance consumers towards risk aversion deters the feasibility of ICT-enabled in insurance domain in general [9, 12].

There are also studies that have focused on cognitive ability of these machines to carry out business processes, replacing manual activity [14]. Nevertheless, none of these studies have examined behavioral aspects I.e., people's attitudes towards robotic technology for reducing information asymmetry in health insurance. Therefore, we conducted in-depth surveys to investigate how people perceive the integration of robot agents in the health insurance value chain. Firstly, we have sought to understand people's perspectives regarding the use of robot agents in health insurance. In doing so, we explored two sub-questions:

(1) What attitudes do people have towards humanoid robots in health insurance?

(2) What benefits can a humanoid robot have over a traditional agent in health insurance value chain according to the people?

RESEARCH METHODOLOGY

The study was conducted using a standard and systematic approach appropriate for qualitative research. A detailed overview of the data collected and the procedures employed for data analysis is provided.

Designing the Questionnaire: A semi-structured interview questionnaire was utilized to collect data for a study on the integration of advanced technologies in insurance services. The questionnaire was developed based on concepts presented in existing literature and refined through preliminary interactions with senior employee's insurance and insurance research organization. During this, we followed standard protocol discussed in existing literature [23]. The interview questions focused on the benefits and drawbacks of advanced technology integration, including during after-service support and complaints, as well as changes in satisfaction, perception, and value creation. Initially, the questions were deliberately broad and simple, with a gradual narrowing of focus as the study progressed. Later on, very specific questions were also asked to understand the possible fears, biases, satisfaction, benefits, and perception in the context of healthcare insurance.

BACKGROUND INFORMATION ABOUT PARTICIPANTS:

In our study sample, there are 40% women and the rest (60%) are men. The age group of participants ranges between 20 to 50 years (20-30 years=40%, 30-40 years=35% and the remainder (25%) belongs to the 40-50 years age group). In terms of education, 69.9% of this population has completed higher education, 20.1% has completed middle education, and 10% has completed lower education. For this study sample 29.7% have met humanoid robots whereas, 70.3% have at least heard or read about them.

PROCEDURE OF DATA COLLECTION:

This study utilized convenience sampling to identify our subjects of this study. However, we have also incorporated snowball sampling on occasion to increase the sample size. The population of interest for our research are individuals associated with the health insurance industry. To gain a more comprehensive understanding of the topic, our sample includes consumers, mid-career sales managers with 6 to 8 years of experience, and agents with more than ten years of experience.

Data has been collected through a three-stage process, with each stage defined by the level of involvement of the subjects with the researcher (see Table 1). In the first stage, the researcher has explained the purpose of the study and asked intended questions. This stage is labeled as such because the subjects are not entirely open during the initial interaction. However, with the help of senior staff members and persuasion, the subjects give responses despite some visible resistance. The researcher continues to contact them but avoids interview sessions to minimize the risk of influencing the subjects. After two weeks, the researcher approaches the subjects for the second round of interviews and find that they are more open to answering the study questions. To gain further insights, the researcher approaches the subjects for a third round of interviews. In the third round, the subjects are found to be more involved, and many have conducted their own research on the topic. Thus, the researcher has conducted interviews with the same respondents in all three stages, focusing on

ifferent dimensions with more in-depth discussions in each setting.

TABLE 1: TOTAL NUMBER OF STAGES AND TOTAL NUMBER OF INTERVIEW UNDER EACH STAGE

Stage	No. of Interviewees	No. of Interviews	Focus of Discussion
I	8	12	Possibility of robots working as a health insurance agents.
II	8	10	Advantages & Disadvantages
III	7	11	Limitation
Total	23	33	

Source: Author

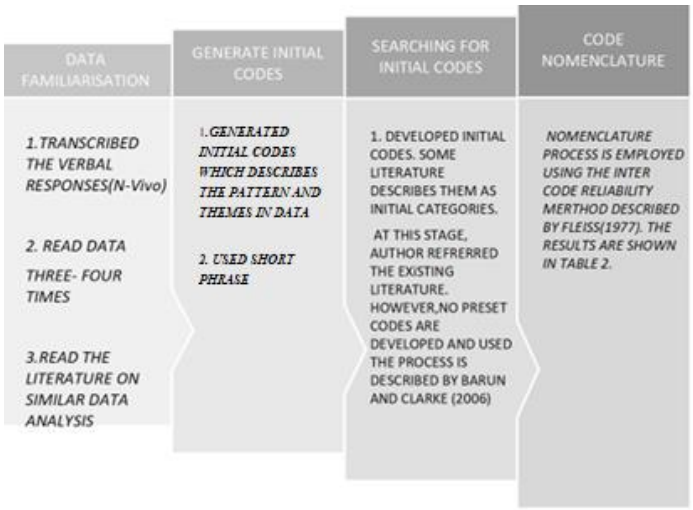
In this work, the researcher follows the protocols of in-depth interview. While in survey, the researcher creates a list of questions before hand, and prompt questions. In the interview, the researcher lets natural conversations emerge based on the prompt statements. However, the researcher sometimes intervenes to redirect the conversation back to the topic at hand. In the current discussion, the researcher tries to capture all the possible factors that can impact feasibility of robots as health insurance agent in reducing the information gap. Therefore, in-depth interviews have been very useful in current scenario. In order to ensure validity, researcher has conducted interview of same people in three different stages with same subject. To do so she keeps the gap of two weeks between the two interviews. After three rounds of interviews, the researcher observes the consistency and maturity in the information. Therefore, author stops the interview. In accordance with the guidelines of Guba and Lincoln [19], the researcher places emphasis on ensuring trustworthiness throughout the analysis of the interview data. As outlined by Guba and Lincoln, trustworthiness comprises four key concepts: credibility, confirmability, transferability, and dependability. These concepts are essential for establishing the validity and reliability of the research findings. Paper has utilized self-correcting methods to improve the study. In order to establish credibility, current study depends on triangulation, and peer debriefing process. Since the topic of discussion in current work is quite futuristic, and much work is yet to be done in this field. Therefore, for the review and literature gap, current study relies on the industry reports and peer debriefing. To overcome researcher's bias, author has used the method of audit trail in the following way. As an initial point, we record the response of each participant and then try to identify initial code and thereafter, second order variables. This process helps in reducing biases as researcher. For qualitative transferability, we have searched some of the similar fields where related innovations are being studied such as medical science, insurance and banking. We find that studies are showing similar result in those fields as well. For example, in healthcare sector, robots are applied with great efficiency however similar problems are seen there as well [23].

The author took help from other researchers for interpretation of participants results. In doing so, the senior administrators of the healthcare organization (All Indian Institute of Medical Sciences, India) were approach for ethical clearance. However, the author was suggested that such ethical clearance is not required as the current study attempts to capture the 'perpetual data' and does not involve any clinical interventions or patient-interactions.

DATA ANALYSIS AND THEME GENERATION:

At the beginning of the analysis, the author utilized N-vivo software to generate initial codes. Due to space constraints, the original responses from the subjects are not included in the paper. However, Figure 1 briefly outlines the data analysis process. The basic codes and broad themes are summarized in Table 2.

FIGURE 1. THIS FIGURE DEMONSTRATES THE PROCESS EMPLOYED FOR DATA ANALYSIS.



STEPS FOR DATA ANALYSIS

TABLE 2: GENERATING THEMES FROM CODES

List of Basic Codes	Themes and percentage of agreement among coders (66.70 %)	Themes and percentage of agreement among coders (67.40%)	Themes & Elements under it
• Information Storage • Random Question • Meticulous Underwriting • Agent converts leads into sales • Part time agents • Full time agents • Particular to details • Empathy • Situational decisions • Sympathy	Human Elements	Machine Elements	Human Elements Emotional Quotient • Empathy • Sympathy • Trust • Long Acquaintance Intellectual Quotient • Situational Judgement • Random Answer • Covert leads into sales • Manipulation Machine Elements • Information Storage • Meticulous Underwriting • Non-manipulative behaviour
	Situational Decision Sympathy Empathy Particular to non-mechanism details Random Answers Full time agents and details Converts leads into sales	Meticulous Underwriting Information storage Part time/ non serious agents	
• Information Storage • Random Question • Underwriting • Sales • Part time agents • Full time agents • Particular to non- automated details • Empathy	Human Elements	Machine Elements	
	Empathy Sympathy Performing Sales Situational Decisions Full time agent	Underwriting Information Storage Part time agents	

• Situational decisions • Sympathy			• Training Need Others • Positioning
• Training • Human Reflection • Erroneous decisions • Large information storage • Trust • Agent's reputation • Long term relationship	Human Element Long term relationship with clients Trust Agents Reputation	Machine Elements Training Human Reflection Less prone to errors large storage capacity	
• Random queries • Personality • Manipulations • Personality • Emotions • Influence • Manipulation • Trust	Human Element Manipulative Personality Trust Random Decisions	Machine Elements Non manipulative Trust that information is correct	
• Emotional element • Reliability • Risky decisions • Trust • Long-time acquaintance • Advice from known one • Intermediary • Direct Sales • Lack of situational judgement • Lack of emotional • element	Human Element Long-time acquaintance Reliability to understand emotional needs of customers. Role of intermediary lawyer	Machine Element Lack of situational judgement Lack of emotional element	
• Manipulative	Human Element	Machine Element	

• Convincing • Information • Storage • Capacity • Emotional intelligence customization of services	• Information	• Emotional • Intelligence	
• Positioning of insurance agents and robotics agents is not the same • Emotions	Human Element	Machine Element	
		• Emotions customization of services	

FINDINGS

Lack of emotional traits such as empathy, kindness and emotional intelligence limit the feasibility of robot agents in the health insurance domain. In general, insurance agents regularly make visits to their clients and better understands the fears and need of their consumer. Therefore, people give more value to long term association over the in-depth product knowledge. Our analysis has also revealed that insurance agents sometimes offer personal favors that are not directly related to insurance sales. These indirect favors can help to facilitate the sales process. However, contrary to this, robots cannot offer such benefits to their consumers. As a result, they cannot match human agents in terms of emotional intelligence. However, robots have an advantage in information exchange due to their capacity to store and process large volumes of data with higher accuracy, aided by AI and ML technologies. They are particularly suitable for tasks that involve screening, validating, and verifying customer information, as well as underwriting policies. This is because robots cannot manipulate information to close sales, which ensures their reliability and accuracy in these specific tasks. While they are not capable of generating new leads or closing sales, insurance managers believe that they could potentially replace part-time agents who have been known to engage in poor policy underwriting practices.

Respondents believe that insurance sales do not occur in automated setting as many a times, people ask the questions that are not directly associated with sales. However, these questions are important for building the trust. Agents can manage such queries but, robots are less likely to handle such random questions.

In summary, traits of agents and robot advisors are partially overlapping. In many ways, these traits are crucial to facilitate the health insurance sales. Therefore, managers and consumers believe that robot advisors can improve the efficiency of health insurance value chain by reducing the problem of adverse selection.

RESULT & DISCUSSION

The study results identify that people believe that both traditional agents and robot agents possess unique traits that are essential for facilitating insurance sales in different ways. While traditional agents may have limitations in processing information from multiple fields, robots lack emotional traits.

such as empathy and building long-term trust that are essential in the health insurance domain. However, these non-overlapping human traits are vital for making insurance sales more efficient. Combining robots with human agents can help improve sales ratios and reduce information gaps. We have summarized this in Figure 2. Similar discussions have been observed in previous studies on the use of robotic advisors in the banking and healthcare industries [11, 16, 20].

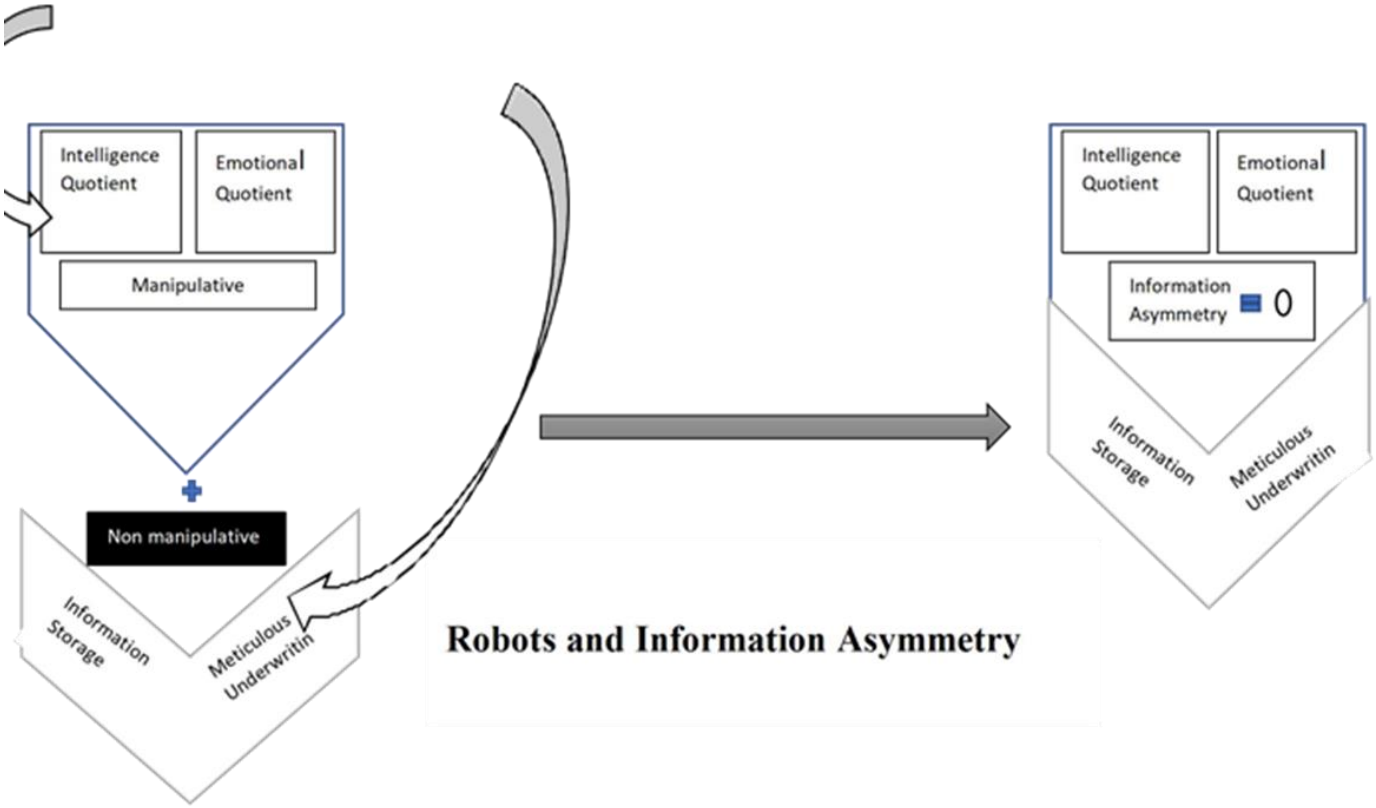
IMPLICATION FOR THEORY:

In a groundbreaking study [17], the author posits that the absence of adequate information in the market leads to the displacement of high-quality products by inferior ones. With the advent of ICT, scholars like [3] and [5] have argued that this technology can significantly mitigate the information asymmetry present in financial markets, allowing superior products to maintain their market share. However, integrating technology in any industry poses numerous challenges, many of which may be behavioral in nature. As a result, several studies [6, 8, 12] have argued that while technology can improve information flow, it may also have adverse effects on certain aspects of the industry. This paper explores people's attitudes towards humanoid agents, within the context of the technology diffusion theory. Our findings suggest that consumer behavior is also a factor that can impede technology adoption, thus expanding the technology diffusion theory in a unique way [21].

IMPLICATION FOR PRACTICE:

The present paper highlights how technology can be leveraged to address these challenges. It is important to note, however, that the implementation of technology must be done correctly and carefully to achieve desirable outcomes. The paper focuses on the potential of robot agents in resolving these issues and finds that these agents are not suitable for working in isolation. Instead, they should be used in conjunction with human agents for optimal results. Consequently, managers can leverage the study's findings and implement robotic technology solutions to reduce information gaps and costs in their organizations.

FIGURE 2: THIS FIGURE DESCRIBES HOW BLEND OF MACHINE AND HUMAN TRAITS REDUCE INFORMATION ASYMMETRY



IMPLICATION FOR POLICY:

All over the world policymakers are facing the challenges of poor universal health coverage due to rising inflation and recent setback of Covid -19. In this regard, the findings of this papers contribute quite practically. Policymakers can further promote robotic technologies to improve the market mechanism in health insurance sector. Additionally, these technologies can also overcome the language barriers using the robot agents/ advisors and can make the health insurance solutions more informed.

CONCLUSION

In health insurance value chain, there is an urgent need to introduce AI and ML based capabilities to increase accessibility, reduce cost, and enrich existing customer experience. Previously studies have supported that robot can assist insurance sale. But the question remained unexplored was in what way? We have answered it in this paper by exploring the feasibility of robotic technology and found that more than anything, correct position of these capabilities is important. When we talk about the "correct position" of these humanoid agent, we are referring to their utility in relation to the specific needs and requirements of the industry. In this work, we have proposed a solution where robotic advisor work in association with exiting agents can reduce the information asymmetry and promote sales of health insurance products. This work presents solutions based on survey to support the utility of humanoid agents in health insurance domain. Implementing this approach would allow firms to meet their sales targets while maintaining standard claim ratios. Consumers would benefit from customized solutions without incurring extra costs. Theoretically, it extends study [18] argument of reducing the information gaps using ICT based solutions. The findings of this study also support the argument of the technology diffusion theory, which states that the successful adoption of technology depends on its compatibility with existing social settings and systems.

The limitation of current study is that we have collected data from limited number of employees, agents, and consumers only. However, this study has tried to overcome this limitation by supporting the findings with with the existing literature. In future, empirical work can further strengthen the findings of this study.

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