

A Review on Performance and Adaptability of Chatbots in Various Industries

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Abstract— This research paper investigates how chatbots generally affecting the market. Due to the variety of advantages, they provide, like better productivity, cost savings, and improved customer service, chatbots are becoming more and more common in the workplace. The study offers a thorough analysis of the body of research on the subject and looks at case studies of businesses that have used chatbots. According to the research, chatbots can improve a number of organizational performance metrics, such as productivity, customer satisfaction, and cost. The report also outlines several possible drawbacks of chatbots, including decreased job satisfaction and privacy issues. The report makes suggestions on how businesses might successfully deploy chatbots and reduce any potential drawbacks. Overall, this study advances knowledge on how chatbots affect various industries and real-time problems and offers guidance to decision-makers thinking about implementing this technology.

Index Terms— Chatbot, productivity, customer satisfaction, benefits, Artificial intelligence (AI).

I. INTRODUCTION

A chatbot is a computer program that uses text or voice commands to mimic human communication and interaction. Artificial intelligence (AI) and natural language processing (NLP) are used by chatbots to comprehend customer requests and understand responses. To offer automated customer service, support, and assistance, chatbots can be integrated into messaging services, websites, and mobile applications. Many duties, like responding to frequently asked queries, making product recommendations, and processing orders, can be carried out by chatbots. They may be created to communicate with users in a conversational and tailored way, enhancing the user experience as a whole. The market size is projected to increase as chatbots continue to help businesses cut operating costs. Chatbots can operate in a variety of markets, including marketing, payments, processing, and customer support, but when it comes to revenue, the service sector dominates.

Chatbot technology has emerged as a hot topic in recent years. Since 1966, when Joseph Weinbaum presented Eliza, a chatbot, the technology has been evolving. It is now becoming increasingly popular on social media and messaging apps. In April 2018, Facebook reported that 100,000 bots had been created on their Messenger platform in just one year (Johnson, 2017). Meanwhile, Canalys predicts that 56.3 million smart speakers, a type of voice-controlled chatbot, will be sold in 2018, up from an estimated 33 million units shipped in 2017 and 6 million units shipped in 2016. (Canalys.com, 2018). The recent developments in Artificial Intelligence (AI) with new techniques like machine learning or deep learning also helped significantly improve the quality of chatbots on parsing human language, understanding contexts, composing replies, or making decisions. This is in

addition to the rapid growth of messaging platforms like Facebook Messenger or Slack and voice services like Amazon Alexa or Apple Siri. [1]

According to Juniper Research, consumer retail spending using chatbots will increase from just \$2.8 billion in 2019 to \$142 billion by 2024. About 40% of internet users globally prefer chatting with chatbots over virtual agents, and as more and more sectors, like retail and healthcare, adopt digital technology, chatbot use is only expected to rise. Microsoft launched a service in 2019 that made it possible for various businesses to create their own chatbots.

Microsoft is the market leader in the healthcare sector thanks to its ability to provide businesses with the tools they need to automate administrative processes. According to Insider Intelligence, chatbot adoption may save the healthcare, banking, and retail industries \$11 billion annually by 2023. Insider Intelligence forecasts that up to 73% of administrative work in the healthcare industry might be automated by AI. Due to advancement in technology, chatbot is also affected and there are so many new technologies are used to develop a chatbot like machine learning, NLP, Voice recognition etc. Even some companies are using chatbot by integrating the chatbot with different technologies. Every company is trying hard to make chatbots more advanced, personalized and user-friendly. The latest “ChatGPT” is an example of this new advancement. On the other hand, Alexa, Google Assistant, Siri by apple are examples of integrated chatbots that are used by millions of users daily.

We will discuss the usage and market performance stats of chatbot in different sectors of market by deeply analyzing the latest facts and figures. Also, the adaptability issues are also discussed by market research.

II. LITERATURE REVIEW

A. Research Questions

Below are some important research mentions that shows the usage of chatbots in different industries like medical, banking, businesses, customer support etc. But the Research question (RQ) is

RQ1: - Which type of industries are currently using the chatbots, and performance stats of chatbots?

RQ2: - What are the adaptability problems chatbots are facing in various industries?

In order to fully grasp the impact of chatbots on the market, we are going to do conduct this study. We will also try to find the adaptability status of chatbots in various industries.

B. Research Gap

Research on chatbots has so far mostly focused on coming up with novel strategies to improve their usability and effectiveness or on observing how users engage with them in a broader experiment [1]. All of the research on the subject of chatbots focuses on either their advantages or their applications in cutting-edge technologies. The most recent research demonstrates numerous approaches to use chatbots in various sectors successfully and more accurately. Several of them are listed below.

There is still a dearth of literature that addresses this issue in a real-world corporate setting. For instance, Xu et al [2] evaluated the efficacy of chatbot responses based on human evaluation. The comparison is between several chatbot development approaches rather than chatbots and people. The use of chatbots was driven by a few key factors that Brandtzaeg and Flstad [3] discovered; however, since the participants were early adopters who self-selected, their viewpoints might not be representative of other users.

The present A. Vaidyam, H. Wisniewski, J. Halamka, M. S. Kashavan [4], and J. Torous explore the evidence for conversational agents or chatbots in the field of psychiatry and their usage in the detection, diagnosis, and treatment of mental illnesses.

A design science research study was carried out by Von Wolff, R. M., Hobert, and Schumann[5] to examine a process based chatbot application for business processes.

C. Sweeney et al [6], Learn about the perspectives of mental health professionals on the usage of chatbots or user interfaces that are conversational and promote people's mental health and wellness. An online survey will be used in this study to gauge participants' knowledge and opinions towards mental healthcare. According to the survey's results, more than half of respondents (65%, p 0.01) believed that chatbots for mental healthcare have some advantages. More than 75% of respondents (79%, p 0.01) concurred that chatbots for mental healthcare could assist their customers in better managing their own health, yet the majority of respondents (86%, p 0.01) believe that chatbots are unable to comprehend or show human emotion. The percentage of

people who believed chatbots were important (74%, p 0.01) was equally high.

We shouldn't adopt an evaluation methodology just because a standard has been established, like the Loebner Prize evaluation methodology used by the majority of chatbot developers, according to Abu Shawar B and Atwell E. [7], who studied the Different measurements metrics to evaluate a chatbot system. Evaluation should instead be tailored to the application and the needs of the user. The best assessment is based on whether the chatbot succeeds in completing the task or providing the service that the chatbot is designed to deliver for consumers.

While interactive systems in the form of chatbots are ubiquitous in private life, according to Brachten, T. Kissmer, and S. Stieglitz [8], their use in corporate settings is still in its infancy. There are currently no clear insights on employees' usage intentions in this field of research. The findings suggest that it is crucial that employees are persuaded of a tool's value for themselves. The study offers conceptual understanding and assists decision-makers in implementing such systems.

According to J. P. Trivedi [9], consumers may perceive some danger in using chatbots because it is a relatively new technology platform. As a result, it is also highlighted that customer experience and the three quality characteristics are both moderated by perceived risk. The study was carried out using the survey approach. 258 respondents provided the data that was gathered. The findings give banks clear guidance on how to improve the consumer-brand relationship by providing chatbots that meet their consumer's expectations.

A.-A. Georgescu [10], The idea of a chatbot is introduced, the key frameworks are emphasized, several effective chatbot educational examples are offered, and the benefits and challenges of employing chatbots in education are also discussed. The evolution, potential, and potential benefits of conversational bots for the educational process are covered in this paper. Lastly, a plan is put up for using a chatbot for education to raise quality of life.

S. E. Finch [12], Emora, the social chatbot created by Emory University, is intended to add experience-focused interaction to the present field of conversational AI. Emora was inspired by studies on the overwhelming prevalence of experience sharing in human-human talks. Emora's emphasis on opinion-oriented exchanges balances the conventional method of information-sharing subject handling, and new conversational skills are built to support conversations that involve a joint understanding and learning process of the partner's life experiences. We describe a curated dialogue system that makes use of sophisticated intent categorization, ontology resources, and highly expressive natural language templates to offer each user an engaging and fascinating conversational experience.

Dekker Izaak, De Jong Elisabeth M., Schippers Michaela C., De Bruijn-Smolters Monique, Alexiou Andreas, Giesbers Bas [13], This technique integrates a focus on life

crafts, individual interaction coaching, and mental health in order to increase total student academic achievement and wellness rather than focusing simply on potential problem areas. We recommend that all students go through this intervention at the beginning of their first year of higher education. The intervention will be given to every potential user at the beginning of the first year, boosting accessibility. The chatbot's immediate availability throughout the first semester of college provides an extra benefit for the early identification and remediation of any problems. The chatbot can be quite helpful in recognizing (the beginnings of) academic and mental health concerns early in the academic year.

These are some key areas in which chatbots are deployed and customers love to use the chatbot. There are some other areas like personal chatbot, ticket booking, FAQ chatbot, status delivery reporting etc. which uses chatbot. We are going to discuss the usage stats and performance of chatbot, after their deployment in various industries and problems. Some of the researches are done on the performance evaluation of chatbot such as Abu shawar and Atwel [7] is a great example. We are going to research about the market performance and adaptability issues that are currently in the path of chatbots.

III. METHODOLOGY

We are going to answer below questions by looking for various facts and figures and deeply analyzing them for insights.

RQ1: - Which type of industries are currently using the chatbots, and performance stats of chatbots?

RQ2: - What are the adaptability problems chatbots are facing in various industries?

A. Medical industry

Throughout time, the usage of chatbots in the medical field has become more widespread, particularly for duties like appointment booking, patient education, and symptom triage. The following list includes some prospective study subjects regarding the impact and functionality of chatbots in the medical sector: Efficacy of Chatbots for Mental Health and Patient Education, Booking reminder, Health queries etc.

Here are the various Chatbots available in market that are providing services: -

- 1: - Elomia
- 2: - Youper
- 3: - Babylon health robo-doctor

There are various studies and facts that prove that chatbots are automating medical industry and providing the best customer support. Some of them are below-mentioned

1: - According to Pwc, 2017, 34% of executive say the time they freed using chatbots allow them to focus on deep thinking and increasing productivity.

2: - According to Insider Intelligence, chatbot adoption

may save the healthcare, banking, and retail industries \$11 billion annually by 2023. Up to 73% of administrative work in the healthcare industry may be automated by AI.

3: - According to tidio, Healthcare chatbots help save up to \$3.6 billion globally.[16]

4: - According to the usertesting's 2019 survey, only 46% people are using chatbots in healthcare industry, just for researching medical symptoms.

By looking on above studies, we can say that chatbot are helpful in reducing time and cost constraints, but there is no exact proof that shows about the number of users that trusted on the chatbot in medical industry. Still, not many users are trusting this new technology for their health insights. Therefore, we can say that chatbots are adapting rapidly in healthcare, but it takes time to earn trust of users.

B. Education institutes

As schools, colleges, and other educational institutions work to give their students more individualized and interesting learning opportunities, the usage of chatbots in education has grown over time.

Chatbots can be used in education in a number of ways, including to personalize learning experiences, make it easier for students and teachers to communicate, and assist student services like academic guidance and career counselling.

The COVID-19 pandemic has also sped up the adoption of chatbots and other digital technologies in education, as many schools and universities have switched to online learning environments and have had to come up with new strategies for supporting students who are studying away from home.

The best example of Chatbot in education is the use of "CHATgpt" in 2023. Below are some facts that shows the performance of CHATgpt: -

1: The website "chat.open.ai.com" received an estimated 616 million visitors in January 2023, according to similarweb.com. [14]

2: - According to Bestcolleges.com survey, the use of ChatGPT and other artificial intelligence (AI) tools to complete assignments and exams is considered cheating by more than half (51%) of college students. The remaining nine were in agreement, while two in ten (20%) disagreed.[15]

These stats and studies are more than enough to show the usage and performance of chatbots in education centers. However, it's a downside that many students are using the tools for cheating. This is the main problem faced by chatbots in education sector.

But the education industry is adapting very rapidly with the chatbot and latest Artificial intelligence agents. There are also many possible aspects of the chatbots. They will act as a mentor or guide for students, if used wisely

C. E-commerce and Customer Support

Chatbots simulate human speech to automatically respond to customer inquiries using machine learning and natural language processing (NLP). Automated dialogues are

becoming more common in organizations, making it easier than ever to get quick answers from them.

While basic human interactions cannot be replaced by AI chatbots, they are excellent for simplifying processes and breaking up monotonous routines. When handling a difficult situation and expressing dissatisfaction, it is ideal to end interactions with competent staff members who are able to provide sympathetic responses. In handling issues that can only be handled by people, AI chatbots in customer service can assist support staff save time.

Here are some facts and studies to understand the performance of chatbots in customer support: -

1: - According to the survey of tidio, 38% users would like to wait for human for support, where 62% would likely to use a chatbot.[16]

2: - About 3 in 4 companies are satisfied with the results of chatbot.[16]

3: - Only 1 in 10 customers rated their last experience with chatbot as negative [16]

4: - About 90% queries are solved under 10 lines by a well-developed chatbot.[16]

These facts and studies clearly show that most of the companies have already adopted the chatbot technology for customer support and receiving good results. Chatbots are serving customers greatly by saving their time and providing useful insights to their question. The main issue is less knowledge. Because chatbots are Computer programs and pre-trained, there's a chance that a chatbot may face difficulty in solving a complex query.

D. Finance

Chatbots in finance can be very beneficial if implemented correctly. They can supply consumers with 24/7 support, individualized advice and help them to manage their finance effectively.

Inquiries about account balances, requests for transaction histories, and fund transfers can all be handled by chatbots, freeing up customer service agents to deal with more complicated issues.

Moreover, chatbots can offer individualized financial advice, such as investment recommendations or debt management techniques, by using machine learning and natural language processing algorithms to comprehend their users' needs.

However, it's crucial to guarantee that chatbots are built to handle customer data securely and adhere to legal requirements. Furthermore, it's critical to make sure chatbots are open and honest about their limitations and give users the choice to speak with a human agent if necessary. An event study of 153 AI chatbot announcements demonstrates that implementation of AI customer service chatbots generates a .22% abnormal stock return, indicating investors response in favor to this practice. Importantly, B2B (vs. B2C) firms have substantially more to gain from implementing AI chatbot customer service.[17]

Below are some interesting facts and studies that shows that chatbots are helpful in finance.

1: - By 2030, it is anticipated that the BFSI (banking, financial services, and insurance) chatbot market will be worth close to \$7 billion.

2: - Customers can save about 4 minutes per enquiry by using financial services chatbots, which will directly improve customer satisfaction.

3: - Chatbots are preferred by up to 43% of banking consumers to handle any problems.

The use of chatbots in the finance sector is growing. Chatbot technology is being used by financial institutions like banks, credit unions, insurance companies, and investment businesses to enhance customer service and streamline business processes. Generally, it is anticipated that the use of chatbots in finance will increase as technology develops and consumers become more at ease using chatbots for financial transactions and advice.

E. Human resources

Chatbots can be useful in recruitment and hiring by automating some of the initial stages of the hiring process, improving candidate engagement, and enhancing the candidate experience.

Here are some ways chatbots can be used in recruitment and hiring:

Initial Screening: Chatbots can assist in the initial screening process by asking candidates basic questions about their qualifications, experience, and interest in the position. This can help filter out unqualified candidates and save recruiters time and effort.

Candidate Engagement: Chatbots can engage with candidates throughout the recruitment process by answering their questions, providing updates on their application status, and offering feedback. This can help keep candidates engaged and informed, leading to a better candidate experience. Chatbots can also schedule interviews by providing candidates with a list of available time slots and reminding them to appear. This can shorten the time recruiters spend scheduling and streamline the scheduling process.

Let's see some stats from tidio[16] for getting valuable insights.

1: - By interacting with job seekers using chatbots, job websites create 95% more leads.

2: - Bots assist many HR departments to save over 12,000 work hours each year.

3: - In 2023, More than 75% queries are handled by chatbot in the hiring and recruiting process, chatbots are crucial. Many job portals use chatbots to deliver more individualized job recommendations, which saves both the provider and the jobseeker time.

In the recruiting sector, chatbots are changing quickly, and in a very short period of time, chatbots and AI agents will entirely.

IV. RESULTS

The role and performance of chatbots in various industries is clear by above analysis. The Problems are also discussed above, that are faced by chatbots in smooth adaptability.

RQ1: - Which type of industries are currently using the chatbots, and performance stats of chatbots?

According to the latest trends, following are the top industries where chatbots are mostly used: -

- 1: - Customer Service and E-commerce.
- 2: - Healthcare
- 3: - Education
- 4: - Finance
- 5: - Travel and tourism
- 6: - Human Resources

We are going to examine results of chatbot performance in market using stats provided by “market.us”. The survey is conducted to predict the future market value and performance of the chatbot.

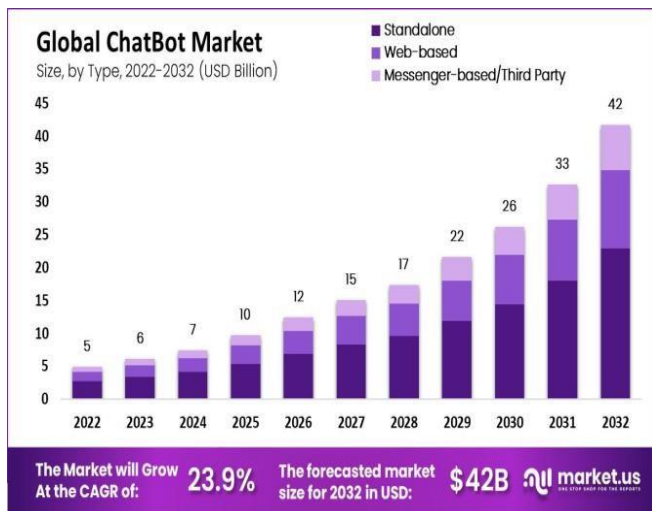


Figure 1 Shows the forecasted market size of chatbot for 2023

The global chatbot market size was valued at around USD 4.92 billion in 2022, and expected to grow with 23.91% Compound annual growth rate (CAGR) from 2023 to 2032. The predicted market value is 42 billion.

According to the Market.us, in 2022, North America is on the top of the market with 40% share in revenue. Asia Pacific is expected to grow at 24% CAGR from 2023-2032.

RQ2: - What are the adaptability problems chatbots are facing in various industries?

Table-1 showing the problems faced by chatbots in each sector.

SECTOR	PROBLEM IN ADAPTABILITY
HEALTHCARE & MEDICAL SECTOR	1: TRUST, 2: HIGH-LEVEL KNOWLEDGE, 3: IMMEDIATE &

	ACCURATE RESPONSE.
EDUCATION	1: MISUSE, 2: HIGH-LEVEL KNOWLEDGE
E-COMMERCE & CUSTOMER SERVICE	NO MAJOR ISSUE
FINANCE	1: HIGH-LEVEL KNOWLEDGE
HUMAN RESOURCES	1: REGULAR ADVANCEMENT

Let's discuss the problems in brief: -

1: - **Healthcare & Medical sector:** Medical and Healthcare industry demands High-level of knowledge and accuracy. Also, the response must be accurate and immediate. The chatbot technology is new to many people in healthcare, so many of them are not able to trust the technology and prefer direct human interaction.

2: - **Education:** The Artificial Intelligence agents or chatbots used in education can be misused by students for cheating and copying purposes. The chatbot should be of high-level, so that it can answer student's queries.

3: - **E-commerce and customer service:** This industry does not have any major problem and currently having largest market share of chatbot revenue.

4: - **Finance:** The chatbot should be high-level, otherwise it cannot be able to keep up with the latest market trends and various arithmetic operations. The model should be of High-level algorithm so that it can handle various arithmetic and logical tasks easily and swiftly.

5: - **Human resources:** Customer tastes, attitudes, and expectations vary throughout time, and firms must keep current in order to compete. A chatbot that was useful in earlier times may no longer be relevant now. Businesses may guarantee that their chatbot are capable of satisfying current client demands by continually improving and monitoring chatbot models. Chatbot models must be constantly improved and monitored to ensure they continue to serve clients in a personalized manner. To ensure best performance, chatbots require constant updates and oversight to keep up with industry developments and user interests, fix limits, and avoid bad consumer feedback.

V. CONCLUSION

In recent years, chatbots have grown in popularity as a result of their capacity to enable efficient and successful interactions with clients. According to industry trends, these intelligent technologies are being incorporated into a variety of sectors, including healthcare, banking, and retail. This is because chatbots can offer prompt and effective customer support, which is crucial for companies to stay competitive in today's quick-paced environment.

Despite all of its benefits, chatbots still have trouble answering difficult questions and adjusting to novel circumstances. The fact that chatbots can only function within a narrow range of responses makes this adaptability problem a key barrier for them to overcome. But, recent developments in AI technology have made new capabilities available that are game-changers, greatly enhancing the functionality of chatbots in a variety of businesses.

It is clear that chatbots have the power to completely change how businesses communicate with their clients. They have previously demonstrated their efficacy in a number of industries, delivering top-notch performance and raising client satisfaction. To increase their adaptability and guarantee their efficiency in a variety of circumstances, however, there is still significant study to be done.

Hence, chatbots are here to stay, and the market is expanding quickly. Chatbots will continue to develop in sophistication and adaptability as technology progresses, becoming a crucial component of numerous sectors. Yet, it is crucial to remember that chatbots are still in their infancy and that considerable work needs to be done to improve their adaptability and guarantee their ongoing efficiency.

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