



ChatGPT: Early Adopters, Teething Issues and the Way Forward

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Authors' contributions

This work was carried out in collaboration among all authors. Author KKK helped in conceptualization, performed methodology, did data validation, formal analysis, investigation, data curation, original draft, review and editing, visualization, supervision. Author SA did the methodology, validation, formal analysis, investigation, data curation, original draft preparation, review and editing, visualization, supervision, project administration. Author DSL helped in structuring, writing, reviewing, editing, and formatting. Author GA did the formal analysis, investigated the study, data curation, original draft preparation and wrote, reviewed and edited the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

From one-way communication to two-way communication, text-based to multimedia, unencrypted to end-to-end encrypted chats, computer, computer-to-human chats have evolved over the years to more sophisticated chatbots, mimicking natural human language based on predefined algorithms. ChatGPT is one of the most recent of such tools and, due to its capabilities has grown tremendously in use. Despite the numerous benefits of ChatGPT, some users have raised

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numerous concerns about its usage. The purpose of this study was to investigate the underlying determinants contributing to the effective adoption of ChatGPT, elicit from users the challenges to the use of ChatGPT, and make recommendations to developers and users on how to sustain ChatGPT. Questionnaires, face-to-face interviews, and focus group discussions were used to collect data for discussion.

The study revealed very high acceptance rates of the chat tool stemming from its initial wildfire spread of over 1 million users within 5 days of launch to the 85% acceptance or perception among users that ChatGPT has the potential to improve how they perform their own daily professional and personal tasks.

Although 90% of users claimed to find the tool relatively easy to understand, navigate and use they also pointed out areas that need upgrading such as inclusion of multimedia and more accessibility features.

Keywords: Chatbot; ChatGPT; NLP; computer-to-human; chat.

1. INTRODUCTION

Computer-enabled human-to-human chats can be traced back to the mid-1960s with the creation of the first computer networks [1,2]. Computer-enabled chatting started off as instant messaging when it was originally used as a notification system for users connected to the same network [3]. The concept evolved from one-way communication to a two-way multi-user communication system by the 1970s when systems such as PLATO were developed by the University of Illinois in 1973 [4,5]. With the rise of the Internet in the 1980s, many new online chat systems were created, including Internet Relay Chat (IRC) in 1988, which quickly became one of the most popular [6]. The 1990s brought the advent of graphical user interfaces (GUIs) and the World Wide Web, leading to the development of many new chat systems. One of the most popular chat systems of this era was AOL Instant Messenger (AIM), created in 1997, which enabled real-time communication between AOL users [7,8]. Chatting and Instant messaging have grown from simple text-based systems to more advanced ones that allow multimedia carriage of data and information. Popular chat systems today include WhatsApp, Facebook Messenger, and Slack [8,9]. As computer-enabled chat systems evolved, another concept – computer-to-human chat systems also evolved. Chatbots are trained to mimic natural human language based on complex inbuilt processing and machine-learning algorithms [10]. Although the original intentions seemed to aim at sector-specific tasks such as in customer service, e-commerce, healthcare, and finance, the apparent increase in efficiency, cost reduction and

improved customer satisfaction [2] may have urged developers to explore the building of chatbot to include the integration of voice and image recognition, sentiment analysis, and predictive analytics, and the use of chatbots on social media platforms, messaging apps, and voice assistants [11,12]. The future of chatbots is bright as they continue to evolve and improve [10,12]. Today, there are countless popular chatbots with different capabilities available to the everyday user.

Joseph Weizenbaum developed ELIZA in the mid-1960s and it is widely considered as the first chatbot, which marked a significant development in the field of artificial intelligence. ELIZA is recognized as the pioneering example of chatbots. Its core objective was to replicate human conversation through a scripted dialogue process. This innovation sparked optimistic prognostications among experts, who anticipated that chatbots would achieve indistinguishability from humans in a relatively short period [6]. In 1972, Kenneth Colby, a renowned American psychiatrist, developed PARRY, an AI program that simulated a patient with schizophrenia. Its underlying goal was to augment the understanding of mental illness and facilitate improved diagnosis and treatment outcomes [13,14]. Jabberwacky, a chatbot developed by Rollo Carpenter in 1988, was designed to provide an entertaining and interactive conversational experience that could simulate natural human conversation. It achieved this goal through a machine learning algorithm that allowed the chatbot to learn from previous conversations and improve its conversational abilities over time [13].

Dr. Sbaitso, created by Creative Labs for MS-Dos in 1992, followed by ALICE in 1995, were AI chatbots that simulated conversation with a real person. ALICE, in particular, not only responded to the user's input but also provided fascinating facts and insights [14].

Smarter Child, developed in 2001, was an AI chatbot that was available on AOL IM and MSN Messenger. It was notable for its ability to engage in fun and entertaining conversations and its quick access to a wide range of services [2,3].

In recent times, there has been intense competition among big tech companies to develop more sophisticated and efficient AI chatbots. Apple's introduction of Siri for their iOS in 2010, with its deep multimedia integration and ability to perform basic physical functions like turning on and off electronic devices, marked a significant breakthrough in the field. Google's response came in the form of Google Now/Google Assistant in 2012, which leveraged predictive search to provide users with easy-to-read information before they even knew they wanted it [3].

Microsoft's Cortana, introduced in 2014, and Amazon's Alexa, a popular intelligent personal assistant that prioritizes voice commands from users, represents significant milestones in the development of AI chatbots [4,5].

The most significant advancement in AI chatbot technology to date is the launch of ChatGPT in 2022 by its creating company, OpenAI. Its arrival has triggered a renewed sense of excitement and motivated further exploration and research in the field of artificial intelligence and its implications on society [4,5]. ChatGPT has many impressive abilities, such as understanding natural language, generating coherent responses, and recognizing patterns in text [15]. However, like all machine learning models, there are limitations such as limited knowledge about specific domains, difficulty with nuanced or abstract concepts, and the tendency to generate biased or inappropriate responses [16]. Although ChatGPT has many advantages, it also has drawbacks. A major problem is how ChatGPT can harm society [17]. This is demonstrated in the fact that ChatGPT like all other AI language models, may inherit biases from the data from which it was trained on. Additionally, it opens up

opportunities for cyber vandals and criminals to quickly learn state-of-the-art skills and use same or unethical purposes. Mention is also made of the growing tendency for students to try to cheat during assignments and examinations using the new found capabilities of ChatGPT [18]. By implication, the fast rate of ChatGPT progress may outstrip regulations and ethical concerns, making it difficult for law enforcement to take action even when clear breaches are perpetrated. The purpose of this study was to investigate the underlying determinants contributing to the effective dissemination and adoption of the ChatGPT; elicit from users the challenges to the use of ChatGPT; and make recommendations to developers and users on how to sustain ChatGPT. ChatGPT represents a significant leap forward in chatbot technology. Its ability to respond to an almost unlimited range of prompts with coherent and engaging responses has made it an important object of study for researchers. Even though there has been much research on chatbots by other researchers, much has not been done on ChatGPT and its associated challenges.

2. METHODOLOGY

In this study, different methods were used to collect data. The data and information gathering for the research commenced by extensively reading published secondary sources, primarily aimed at gaining a deeper understanding of the past and present developments in the Chatbot realm. All such sources, where applicable, have been duly credited in accordance with best research practices.

Primary data collection utilized various methods. Two focus group meetings were organized, predominantly comprising students from two universities. The composition of these groups varied in terms of academic backgrounds, with the majority pursuing tertiary programs in Science and Engineering. These meetings served a dual purpose: gathering quantitative data and collecting qualitative anecdotes. The first focus group involved 28 university students; only 2 participants remained passive throughout the entire meeting. The second focus group was conducted online via a temporary WhatsApp group, lasting 48 minutes, and witnessed participation from 61 individuals at different intervals, with 23 contributing at least once during the session. Invitations for the second

focus group were distributed by sharing URLs accompanied by concise introductory statements across several social media platforms and groups.

The qualitative data obtained was complemented by quantitative data collected during a 10-day survey, which yielded 167 valid responses.

In a subsequent phase of the research, face-to-face interviews were conducted with 8 purposively selected individuals - five conducted in-person and three via the video conferencing tool, Zoom. These interviews targeted academics and industry practitioners deemed to possess substantial knowledge of the technology industry, providing invaluable insights to the research team.

3. RESULTS AND DISCUSSION

3.1 What Made ChatGPT so Successful? - Diffusion of Innovations

The Diffusion of Innovation theory seeks to explain how new ideas, products, and technologies, such as ChatGTP spread through society [19].

In summary, the theory states that the spread of innovation through society can be influenced by factors, such as the perceived benefits of the innovation, its relative advantage over existing technologies, its complexity, and the level of compatibility between the innovation and the values and norms of the community. Innovators and early adopters play a critical role in spreading innovation by acting as opinion leaders and influencers within their social networks.

Just like every technology, the growth in usage of ChatGTP went through phases with the exception that this growth was a record-breaking one.

3.1.1 Awareness

The first stage of the diffusion of innovation is awareness, where people become aware of the new innovation. In the case of ChatGPT, its awareness was initially limited to a small group of researchers and developers in the field of artificial intelligence until a public announcement in late 2022 [12,20]. Aided by social media, the

Chabot broke records by gaining 1 million users in the first five days after it launched, according to Sam Altman, OpenAI's CEO [6].

3.1.2 Interest

Once people became aware of ChatGPT, they became interested in its potential applications and benefits. This research team observed prolonged conversations on social media platforms, and seminars, among faculty and the general public. Students immediately saw this as the tool with all the answers to the assignments, and faculty saw ChatGTP as an advantage for more efficient research but also a threat to authentic work. Many users claimed it gave them a new conversational experience. Above all, researchers and developers impressed by its linguistic capabilities began to explore possibilities. They as well continued to recommend it via academic, technical, and social circles. The success of ChatGTP can largely be attributable to its advanced GPT architecture, massive training data, and awareness and use by innovative users. UBS, a Swiss bank, declared ChatGPT the fastest-growing app of all time pointing to its achievement of a 100 million active users only two months after its launch the second in that order is TikTok which took nine months to achieve the same [13,14].

3.1.3 Evaluation

As researchers and developers began to evaluate ChatGPT's capabilities, they recognized its potential for a variety of applications, including natural language processing, chatbots, and virtual assistants [21]. The explosive use of ChatGTP-like AI tools and the immediate use (and possible abuse thereof) caused alarm even to the most tech-savvy, to the point when Elon Musk, a leading tech personality called for a pause in the development of AI in general [22,7,8].

3.1.4 Trial

Given the current developments, this paper posits that ChatGTP is currently in the trial phase. Researchers, developers, and ordinary users have begun to experiment with ChatGTP on a small scale. From testing its ability to solve riddles to its ability to generate complex computer code, student users interviewed by this research were constantly finding new ways to

explore. Developers have also begun to explore ways to embed the Open code behind ChatGPT into their applications.

The next two phases of the Innovation Diffusion theory, at the moment, may only be looked at with a predictive stance. The authors thus try to predict what would happen as the technology goes through the Adoption phase where its capabilities, potential applications, and limitations became more evident to early adopters. The final phase is Confirmation where it is anticipated that ChatGPT may have received positive feedback with results from early adopters reinforcing its reputation as a powerful tool. The authors, however, do our predictive analysis on the back of the reality that there is fierce competition in the AI and Chatbot space. Using the Technology Acceptance Model, the research peered into the future.

3.2 A Picture of the Future - Technology Acceptance Model

The Technology Acceptance Model (TAM) was developed in response to concerns that employees were not efficiently utilizing available Information Technologies [23,24]. TAM's creators believed that the key to increasing IT use was to first increase its acceptance, which could be evaluated by asking individuals about their future intentions to use it. Early research on TAM found that only two factors were necessary to comprehend, forecast, and potentially manage acceptance; Perceived Usefulness and Perceived Ease of Use. As per [9], TAM is a widely used theoretical framework for understanding how people perceive and adopt new technologies. In this research, it was used for predictive analysis of what may influence users' continual use of ChatGPT.

3.2.1 Perceived usefulness of ChatGPT

The following questions were the key guiding questions in our discussions and survey.

- How likely do you think ChatGPT would enhance your productivity or make your life easier?
- In what ways do you think ChatGPT could be useful for you?
- How important do you think ChatGPT would be for accomplishing your tasks or achieving your goals?

- Do you think ChatGPT could improve the quality of your work or decision-making?
- Would you recommend ChatGPT to your colleagues or friends for their own tasks or goals?

Of the 167 respondents who completed the survey, 85% perceived ChatGPT to have the ability to enhance their productivity in their main occupations and make their lives, generally, easier. At the same time, 92% of respondents indicated belief in ChatGPT's potential to help them with research and knowledge acquisition. Fifty-three of the respondents (32%) claimed they were small-scale business owners, 48% of whom mentioned that it could help them with customer service and support.

On the question of accomplishment of goals (examination success for students, increased margins for business owners), 86% of respondents were upbeat that ChatGPT would be important or very important. A bit more than half (54%) of respondents were positive about the potential impact of ChatGPT on their decision-making process with 32% of respondents however indicating they were unsure.

During the focus group discussions, participants gave more meaning to the responses captured in the survey. A respondent pointed out that "I was shocked how clearly it gave me answers for the quiz our lecturer gave us. My work was just to fix in local examples"

Another participant mentioned that "I simply bulleted my products, work hours, and contact details and ChatGPT wrote a whole radio LPM [Live Presenter Mention] for me".

From mundane conversations to the generation of complex computer programming codes, users seemed generally impressed and quite sure there is more to ChatGPT than they have explored.

"I would be surprised if any tertiary student is not yet aware of this thing but I would definitely recommend it to my colleagues and friends.", one discussant added.

3.2.2 Perceived ease of use

To test this, the following questions were embedded in the survey and questionnaire;

- How easy was it for you to understand and use ChatGPT?
- Were the instructions for using ChatGPT clear and easy to follow?
- How long did it take you to become proficient in using ChatGPT?
- Do you feel confident in your ability to use ChatGPT for your intended purposes?

The quantitative responses indicated that the participants found ChatGPT easy to understand and use. The average response of 4.45 on a 1 to 5 Likert Scale. The *ease-of-use* question indicates that the users perceived ChatGPT as relatively easy to use.

User-friendliness of ChatGPT returned an average of 4.6 on the same scale suggesting that the participants found the interface intuitive and easy to navigate.

The clarity of instructions for the use of ChatGPT was rated as 3.9 indicating that the participants perceived the instructions as mostly clear and easy to follow.

In the follow-up discussions, 8 respondents, a small but significant proportion (a $p < .05$) actually indicated they did not see any instructions for use. The average response for *perceived proficient uses* was 1.5 times and less than one hour of use time. Participants thus claimed to have been able to learn the use of the platform relatively quickly. Finally, the participants expressed high levels of confidence in their ability to use ChatGPT for their intended purposes, with an average response of 4.72.

The authors have highlighted a few representative responses from participants.

- "Honestly, I found the app surprisingly easy to use. Initially, I thought the person who introduced it to me was just trying to impress me, but once I got started, it was quite straightforward to understand and navigate."
- "ChatGPT is incredibly user-friendly. I came across a cheatsheet which has helped me to unlock a lot of stuff. This thing is crazy."
- "I don't think there is even the need for instructions. Did anybody ever teach me how to chat?"

- "Yes, I feel confident in my ability to use ChatGPT as a future Marketer. It will replace Google and save hours in the future."

3.3 What More do users Want to See?

The research deduced from responses that the learning curve was relatively low and allowed users to quickly feel proficient and confident in their ability to use it for their intended purposes. The authors, however, pushed further with the view to elicit responses, if any, that would indicate some difficulty or a call for improvement with "What do you think is lacking?".

The evolution of natural language processing (NLP) technology has led to the development of advanced language models such as ChatGPT. ChatGPT has demonstrated impressive capabilities in generating human-like responses to natural language queries, it has, however, only increased the appetite of users and shown the way to competing platforms. Below, are some verbatim and paraphrased input from respondents. In combination with literature, the paper makes some recommendations for developers and users.

"When you ask questions that require opinions, the responses sound more like a boring father trying to hide the truth from his child. A bit more humour and age-appropriate responses will help to make it more human-like. The developers should let the system do more analysis of its interactions with users to identify areas where it can improve its responses and learn from its mistakes". Respondent 2 (A teacher)

"We are in a multimedia world. Any tool that is fully text-based, is likely not to last. Developers should find ways to integrate some visuals, for example, it did a great job at describing Grave's syndrome to me, but a few images, in addition, would have been excellent". Respondent 1 (A Nursing student)

Some respondents seemed to have found ways to "extend" the use of the application by using its output as input for other AI tools:

"I typed a number of phrases to describe an artwork I had in mind. ChatGPT basically generated art prompts which I literally copied and pasted in Mid Journey. In

less than a minute, I got an artwork that would have taken me lots of hours to create." Respondent 7 (An Arts teacher)

Some respondents almost got emotional with their expression of perceived downsides.

"I was shocked to see ChatGPT didn't even know who the current AFCOM champions are. The excuse of a knowledge cutoff date of 2019 is honestly becoming annoying. How long are they going to take to update it?". Respondent 15 (An Accountancy student)

Some more tech-savvy respondents were more nuanced in their responses and gave more technical input.

"You may not be aware, but even Elon Musk has asked for caution in the further development of AI tools. It can easily cause a disruption in our lives that will require a long time for us to adjust to." Respondent 16.

3.4 Some Anticipated Challenges

According to Condon [25], the biggest US school district recently blocked ChatGPT, and the reason for this action was explained in a statement released by the district. Due to issues of plagiarism or academic dishonesty, some institutions have actually taken the step to block access to ChatGPT.

The potential of ChatGPT to do more than it is intended is real and even foreseen by some of the strongest proponents of AI like Elon Musk and other technology engineers who pleaded that further AI development be halted for a while [26].

4. FINDINGS

The authors opted to use the Diffusion of Innovations theory to study ChatGPT's relative success. It found from existing sources and primary data that right from its remarkable success of reaching 1 million users within five days of launch, users, particularly students and faculty have discovered the transformer as a productivity-enhancing tool, while developers have recognised great potential in its programming language capabilities. Academics point out the potential to enhance research.

The research also sought to study User Perceptions into some detail and opted to use the Technology Acceptance Model (TAM) for that.

Perceived Usefulness and Ease of Use: While about 85% of all respondents believed the tool as having the potential to improve their personal efficiency and valuable for decision-making, they found it as well relatively easy to understand, navigate, and use (90%). They however had expectations for future enhancements including more human-like responses, multimedia integration and ability to give answers to questions on current or live issues.

5. RECOMMENDATIONS - KEEPING ChatGPT RELEVANT

The recommendations from interviewees and the research's own synthesis pointed to some key areas for developers and users to consider.

5.1 Recommendations for Developers

- i. Integration with other existing platforms like Midjourney, Speechify.com or Invdeo.io can add value to ChatGPT's functionality. By integrating with these platforms, users can enjoy a more comprehensive experience that includes features and tools from different platforms. For example, integrating with Midjourney can provide ChatGPT users to generate images from natural language descriptions, while integration with Speechify.com can provide users with text-to-speech capabilities. The research takes note that some popular search engines and web browsers have already integrated the bot into their functionalities.
- ii. Developing ChatGPT to make it more accessible such as the inclusion of braille features, can be beneficial for visually impaired users. Braille in ChatGPT for example, can help visually impaired users interact with the system more effectively and provide them with a more inclusive experience.
- iii. Speech-to-text capabilities can be a useful feature to include in ChatGPT. This feature can allow users to communicate with ChatGPT using their voice instead of typing, making the system more accessible

and user-friendly. Speech-to-text can also be helpful for users who have difficulty typing or are in situations where typing is not feasible.

- iv. Including the ability to display current ongoing events can help ChatGPT users stay up-to-date with the latest news and trends. This feature can provide users with relevant and timely information about topics that interest them, such as live scores from sports, politics, or entertainment. By providing users with current events, ChatGPT can enhance the user experience and make the system more engaging.

5.2 Recommendations for Users

Users in this context refer to anybody who is not an AI developer but finds some advantage in the application of ChatGPT. ChatGPT is definitely a disruptive technology. We recommend the following:

- i. Users should update themselves and let ChatGPT become complementary to them rather than the competition. ChatGPT is designed to assist and provide value to users, not replace them. By keeping themselves updated on the system's capabilities and features, users can use ChatGPT more effectively and efficiently. This will allow users to focus on tasks that require human expertise and leave mundane and repetitive tasks to ChatGPT.
- ii. Educational institution authorities should not contemplate limiting the use of ChatGPT as has been done elsewhere, students should rather be taught how to use it while pointing out the negatives of an over-reliance on the application.

6. CONCLUSION

The study aimed at investigating the underlying determinants contributing to the effective adoption of chatGPT; eliciting from users the challenges to the use of ChatGPT; and making recommendations to developers and users on how to sustain ChatGPT.

It was found that ease of use, accuracy of response, swift responses, enhancing productivity, research, and decision-making were major determinants of ChatGPT's adoption. However, responses should not be limited to text.

It must include images and video. Also, braille features should be added to help people with visual impairment.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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