ChatGPT: The advancement of knowledge and incorpertation for its users

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*Abstract*—200-300 word to be place here, to surmise the document in a punchy way, intro the paper, what’s it’s about, the research to conduct, the questions to ask, how data is collected, how it is processed, what key results and opinions form, what this means and what it can be going forward.

Keywords—ChatGPT, Knowledge Acquisition, user perception, something, something else

# Introduction

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# Literature Review

## Background and Aims

ChatGPT – is a large language Model (LLM) Artificial Intelligence (AI) tool created by Open AI which answers requests via Natural Language Processing (NLP) tasks [1], applicable in various practices. However, does ChatGPT allow for further education or knowledge enhancement for its users? Therefore, this chapter aims to examine currently available research and literature – or lack thereof - on whether users get to enhance knowledge further in that area from their perspective, and if so, is ChatGPT then incorporated into their day-to-day activities. The proceeding sections intend to highlight the literature reviewed and break out into separate themes uncovered.

## Research found upon ChatGPT evaluation and its uses

A study seen from Surameery and Shakor [4], examines ChatGPT use in solving programming bugs, understanding if the tool aids in debugging assistance, explanation, and corrections for software development practices. Additionally, a comparison conducted between ChatGPT and Integrated Development Environments (IDE’s) testing effectiveness between practices. This study is extended further from works by Sobania et al [5] and Bang et al [6]. The study – in silo – provides some context about how ChatGPT can be used and against other tools but provides no specific examples as to what bugs were explored and how they were solved. Additionally, there was no research conducted on software developers using ChatGPT to solve any programming problems nor a perception of how this has helped them.

With Sobania et al [5], an evaluation performed back in January 2023 against ChatGPT on responses regarding if a piece of code has a bug and how it should be fixed; concluding a mostly positive but mixed results on performance – particularly where verification is needed, but better responses compared with other tools once context is applied on either side of the query. This study extends research from Surameery and Shakor [4], showing detailed examples of prompts used and responses from ChatGPT stating “would yield ChatGPT to be a viable tool that would help software developers in their daily tasks”. This excerpt from the research was not the focus and more a foundation that can be built upon, where the research proposed helps at least partially address the gap the above research presents.

Additionally, Bang et al [6] evaluates ChatGPT against a series of public datasets covering different tasks, and how it compares with other LLM’s – stating a good performance, but not without the risk of external hallucination – where a confident response is received without any justification from its training.

An article by Su, Lin, and Lai [29] suggests using ChatGPT to support students' argumentative writing in classrooms. The authors propose that ChatGPT can help students formulate clear and logical claims supported by evidence to persuade others. They conducted experiments with ChatGPT using various prompts to measure its feedback performance. Additionally, they recommend that teachers instruct students to create their own outlines before seeking feedback and inspiration from ChatGPT for future learning. While this paper showcases the potential benefits of using ChatGPT in the classroom, it lacks an experimental exploration of student control and test groups to evaluate the impact on argumentative writing performance. Furthermore, the perspectives of both teachers and students regarding the use of ChatGPT in this context remain unexplored, presenting an opportunity for further investigation.

Based on all studies presented above, all bare similar themes testing ChatGPT and its application with evaluation against different metrics, other LLM’s or other tools. More importantly, a gap is seen throughout the literature so far in that, whilst ChatGPT has been tested on performance and use in silo for a particular use or topic, no views from an array of users have been collected to understand whether users have used or adopted its practice on the scenarios presented above, giving space for this proposed research to explore this gap.

## Research on ChatGPT and the enhancement of user knowledge and incorporation

Aljanabi [7] extends the notion of using ChatGPT, enabling possibilities and future directions for users and the software itself. This paper provides a great introduction into the use of ChatGPT and opportunities it presents, such as a potential for user personalisation, and alluding to integration for different working fields, enhancing lives in meaningful ways. However, as Aljanabi [7] frames this work as an introductory piece into the subject, no specific examples are tested either in a standalone study or across a sample of participants assessing claims made here are proven.

Similarly, an excerpt from Liberman [8] suggests ChatGPT as a tool to explore sources of information for users, focusing on students as a primary user, assisting with understanding context of a subject. Although, Liberman does go further to say that ChatGPT may not provide accurate information in all areas for its user. Again, this source does provide a highlight on what ChatGPT is and how it can be used to assist with context, but little information of how it provides knowledge enhancement and detail is lacking to explain this further, which is understood considering the context of the source.

Whilst sources above provide more of an introduction into ChatGPT as a field to explore rather than how users perceive the use of ChatGPT, the next set of sources delve further, albeit with limited range. A study produced by Kung et al [8] explored performance of ChatGPT on the United States Medical Licensing Exam (USMLE). Although the research’s primary focus was testing ChatGPT performance against the exam, a discussion was made on results on whether ChatGPT can assist knowledge enhancement for users taking the exam by providing insight into areas that need development. However, limitations of this research keep it focused on ChatGPT and its output from USMLE, other than alluding exploration into knowledge enhancement for medical students taking the exam and further incorporation into day-to-day use. Therefore, a gap in the study is represented by no medical student participation shown against this study to explore the improvement of scoring in the USMLE.

A separate study found from Yue et al [9] explores the use of ChatGPT in providing financial knowledge to non-financial users, testing queries on how it can explain financial terms and metrics such as alpha, beta, earnings to price (EP) or Illiquidity to a user based on different context and publication approaches. This study is beneficial in that ChatGPT has the potential to help individuals gain financial knowledge to assist in making informed decisions. However, there is no evidence of testing these exercises against participants to test the claims made, on whether information provided is understood and helpful as well as adds to their day-to-day routine expanding knowledge further.

To summarise above, evidence is found exploring the notion of ChatGPT against users for knowledge enhancement, and a good introduction into possibilities that could be held here, although there seems to be a gap in measuring user engagement of the tool, instead focusing more of what the tool can do.

## Research on ChatGPT with user perception

Only one piece of research came through thus far, which looks to understand the use of ChatGPT from a user perspective, which is conducted by Tlili et al [10] via case study on the use of ChatGPT, and its perception from educational users, including initial user interactions and experiences. A series of analyses were conducted including Twitter network and sentiment analysis on tweets relating to ChatGPT. Additionally, interviews were conducted on participants, quoting that ChatGPT could be used as a learning aid, or for idea generation.

The study above found that whilst not much other research is available showing user perceptions on ChatGPT, it provides a great foundation to build upon. There are limitations with this research however, such as a small group of participants involved in the study, a focus within education rather than a broader perspective, and qualitative, not quantitative research, therefore whilst themes are generated, there is no way to measure user’s perspective.

## Literature review conclusion

The purpose of this chapter evaluates current research available on participants who have used ChatGPT, and whether it has enhanced their knowledge either generally or within a specific realm, or if so, does ChatGPT become incorporated into day-to-day activities. It appears though this review, that use of ChatGPT is still novel, since its release from Open AI in November 2022 [2]; and whilst at least one paper has made some progress in this area, the belief is that their gaps within research are prominent on accommodation of participants and understanding their interactions rather than separate stand-alone studies of the research or topic alone.

# Methodology

The goal of this chapter is to explain how the research was performed, to establish whether ChatGPT – if used – has enhanced a user’s knowledge; and if so, has ChatGPT then since been incorporated into a user’s routine for knowledge acquisition.

## Research Design

This dissertation uses a quantitative study for its speed and ability to address specific questions, allowing for future repeatability and measurement of attitude changes [10-11]. The quantitative method offers objectivity, generalisability to a broader context – enabling a foundation to build further research upon, and the ability to measure the potential cause and effect between users' knowledge enhancement of ChatGPT and its incorporation into daily use. Statistical inferences can also be used to test the hypotheses set [11-12]. Qualitative research, although valuable for building themes, providing context, and gaining insights from participants, will be a good candidate for future studies once this preceding research is complete. Due to time and resource constraints, a mixed method approach is not feasible, making the quantitative study the preferred approach.

### Quantitative Research Method

Quantitative research will utilise a survey study methodology to collect information via a questionnaire, asking specific, mainly closed-ended questions and analysing the results [14]. The purpose of the survey is to gather participant feedback on ChatGPT's usage, knowledge enhancement, and adoption. Conducted online, it aimed to access a large participant group to help ensure an optimal response rate compared to physical submissions [14]. The survey is cross-sectional as the research is novel, to establish responses from one point in time [15] over a period of approximately one month, that could be potentially compared against for future research.

## Preparation

Before research began, the survey was created ready for distribution, aimed to be done within the research project timeline. A copy of the survey used can be found in Appendix A.

## Population

The sample size used in this research consists of all ?? individual responses who interacted with the survey providing input regarding the topic of ChatGPT. However, some user characteristics were collected to allow for analysis and aid future research.

## Data Collection

As this research utilised an online survey, an online questionnaire instrument was deployed. This instrument was created via a software tool known as Google Forms. With this method, a link was distributed via social media posts or direct communication on multiple platforms such as LinkedIn, Discord, and Facebook. The steps followed in the data collection process were the following:

1. A link shared with individuals across multiple social platforms to access the Google Forms survey created. Additionally, a link to the created questionnaire will be distributed via email or direct communication via social media where requested.
2. The participants answered questions and made their submission.
3. At the end of the time allotted to receive responses, data was exported from Google Forms into a downloaded CSV (Comma Separated Values) file.
4. Once the CSV file has been downloaded, it was then imported into a python script producing the relevant statistics and analysis.

## Data Analysis and Results

### Management and Storage

As described in the previous section, data was collected via a Google Forms questionnaire, then exported into a CSV (Comma-Separated Values) file, which then is imported for analysis and statistical generation.

### Software and tools used for data analysis

The CSV file was imported into Python, a user-friendly and interpretable high-level programming language [16]. Python supports data analysis through libraries like pandas for data analysis and manipulation [21], SciPy for statistical tests [22], matplotlib for standard data visualisation [23], and seaborn for statistical visualisation [24], all facilitating statistical analysis and data visualization for the collected data.

### Data analysis steps

The following list of tasks were executed to present findings and derive insight from the data collection:

#### Conversion of values

Most participant data collected will consist primarily of categorical responses, including yes or no choices and some characteristic information selected from multiple choice selection (e.g., occupational background, highest level of education). Consequently, data conversion also transformed categorical values into numerical representations, utilising transformative logic.

#### Descriptive Analysis

Initial analysis summarised data points using tables and graphs. Examples included total participant count, percentages of population with specific characteristics. Additionally, analysis addressed the main research questions:

1. How many participants found ChatGPT enhanced their knowledge? What percentage of the population reported knowledge enhancement, and the percentage where it did not.
2. Among participants who reported knowledge enhancement, how many now use ChatGPT for knowledge acquisition? This analysis will provide percentages for both the subset and the entire sample.

The analysis also explored the limited participant characteristics for potential insights.

#### Pearsons Correlation Coefficient

Pearson correlation assesses the strength and direction of a linear relationship between two variables, indicating their closeness [19-20]. This study examines the association between ChatGPT users who have experienced knowledge enhancement and the integration of ChatGPT into their daily knowledge acquisition routine. The `dataframe.corr('pearson')` function in pandas [21] will be employed to generate a correlation table. A positive correlation was anticipated, signifying that users who enhance their knowledge with ChatGPT are inclined to incorporate it into their regular knowledge-seeking practices.

#### Hypothesis Testing

To assess the statistical significance of the survey results and investigate the two hypotheses, an employment of the binomial test in python was used using the scipy.stats library package. The null hypothesis, in both cases, will assume that only 50% of the participants reported an improvement in their knowledge and the inclusion of ChatGPT as a tool for regular knowledge acquisition. Should more than half of the responses demonstrate this trend, the null hypothesis will be rejected, and the alternative hypothesis, which aligns with the research theories, would be accepted. **(Reference needed)**

### Results from analysis

The results are then displayed in both tabular, graphical – in terms of data visualisations and textual formats for the reader dependent on the context of what is being shown.

## Ethical Considerations

As this research involved the perception of participants’ view in form of a quantitative survey study, there remained potential items that were considered. Participants' rights had been prioritised throughout the study, and all procedures will adhere to ethical guidelines outlined by The Institute of Electrical and Electronics Engineers (IEEE) [25] within their code of ethics [26].

Participants were provided with a clear explanation of the study's purpose, the benefits this research aims to bring, and procedures involved. Informed consent was obtained from each participant before participation ensuring they can withdraw from the questionnaire at any time, confirming they can make informed decisions. The consent was documented through the online survey platform, with participants required to indicate their voluntary participation by selecting the option “I agree to these terms and wish to participate”, before the survey began.

Participants' confidentialities were maintained. Data collected is stored and anonymised. Only the researcher the dissertation supervisor will have access to the data, which will be used solely for research purposes. No personal identifying information was expected in the survey results but was separated from survey responses during analysis.

The study poses minimal risks to participants. However, measures were taken to mitigate potential risks, such as providing clear instructions on the survey process to avoid any confusion. No conflicts of interest that could compromise the objectivity or integrity of the research were detected.

### Action to obtain ethical approval

To get ethical approval for this research project, a proposal was sent to the dissertation supervisor, due to the ethical consideration outlined. Whilst this study involves the use of humans to get their views on the use of ChatGPT, there is minimal to no harm or misconduct expected towards participants who engage with the survey. A signed copy of the ethical approval of research projects in online programmes form can be found in Appendix A.

## Limitations

Particularly as this piece delves into a novel area concerning ChatGPT limitations were uncovered and need to be addressed to provide as much transparency as possible. Due to limited time and resources, only one survey will be conducted with a limited series of mostly closed questions to gather prompt and enriching feedback. Additionally, the analysis will be limited to the collected data without comparison to other datasets, due to the lack of research in this area. Furthermore, it is important to note that bias may be introduced in this study as participants interested in the topic may be the only ones who choose to participate.

# Intial findings and Data collection

Clearly identify the data relating to research hypothesis and questions a useful way to present your data, only tables here, use graphs for analysis and discussion

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## Figures and Tables

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# Data analysis

The chapter looks at was done with data found from findings the results of research study and only based on data collected.

# Results and discussion

Interpret what the results mean and discuss the implications why are results important, and what limitations in what the results are saying.

# Conclusion

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## Future work

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## Recommendations

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# Appendices