Engineering students' perception towards Usage, challenges and risks associated with ChatGPT

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Abstract:

This study aimed to investigate engineering students' perception towards the usage, benefits, challenges, and risk of ChatGPT, a large language model developed by OpenAI. A total of 460 engineering students from different universities and different streams participated in apersonal survey, with structured questionnaire with closed ended questions. A stratified random sampling method adopted for selection of the respondents.

The results of the study showed that the majority of engineering students410 (or 89.13%) are aware of CHATGPT, while 47 (or 10.22%) are not aware of it. Additionally, only 3 respondents (or 0.65%) are not sure if they are aware of CHATGPT. "Providing personalized customer support and assistance", has the highest mean value of 4.33, which suggests that it is perceived as the most important use of CHATGPT by the participants who responded to the survey

However, the study also revealed that engineering students face several challenges when using ChatGPT, such as difficulty in understanding the language used by ChatGPT, accuracy issues, and the possibility of plagiarism. Additionally, students expressed concerns about the potential risks associated with ChatGPT, such as data privacy and security concerns.

In conclusion, the study indicates that engineering students have a positive perception towards the usage and benefits of ChatGPT. However, they also face several challenges and perceive certain risks associated with its usage. The study recommends that educators and developers of ChatGPT address these challenges and concerns to ensure its effective and safe usage.

Keywords" ChatGPT, Perception, engineering students, perceived benefits, risks, challenges

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Introduction:

In recent years, technological advancements have revolutionized the way people interact with machines and artificial intelligence. The emergence of large language models (LLMs) such as ChatGPT, developed by OpenAI, has provided individuals with an innovative way of interacting with machines using natural language processing (NLP) techniques. ChatGPT is a powerful language model that can generate human-like responses to natural language inputs, providing users with a new level of convenience and efficiency. It has the potential to revolutionize various industries, including education, healthcare, and customer service.

As engineering students are at the forefront of technological innovation, it is essential to investigate their perception towards the usage, benefits, challenges, and risk of ChatGPT. This study aims to address this gap by exploring the engineering students' perception of ChatGPT and the impact it has on their academic and personal lives.

Usage:

The usage of ChatGPT among engineering students has become increasingly popular in recent years. ChatGPT provides a convenient and efficient way for students to access information, communicate with peers, and seek assistance from professors. With the rise of online education, the usage of ChatGPT has become more widespread, as it offers an excellent alternative to traditional classroom learning. Engineering students can use ChatGPT to find solutions to complex engineering problems, ask questions about coursework, and collaborate on group projects.

Benefits:

The perceived benefits of ChatGPT among engineering students include time-saving, easy access to information, improved communication, and enhanced creativity. ChatGPT can generate human-like responses to natural language inputs, saving students' time and effort spent researching and reading textbooks. This benefit is particularly useful for engineering students who face a heavy workload and time constraints. ChatGPT also provides easy access to information, enabling students to find answers to their questions without having to navigate through various sources manually. Improved communication is another perceived benefit of ChatGPT, as it can facilitate effective collaboration among students and professors. Finally, ChatGPT can enhance creativity by generating novel ideas and insights, inspiring students to approach problems from different perspectives.

Challenges:

Engineering students also face several challenges when using ChatGPT. Some of the significant challenges include understanding the language used by ChatGPT, accuracy issues, and the possibility of plagiarism. ChatGPT uses a vast database of language patterns and grammatical rules to generate responses, making it challenging for users to understand the language used by ChatGPT. Furthermore, ChatGPT's accuracy issues can lead to incorrect or

incomplete responses, potentially leading to erroneous conclusions or decisions. Additionally, the possibility of plagiarism arises when students use ChatGPT to complete assignments or coursework without proper citation.

Risks:

Engineering students perceive several risks associated with ChatGPT's usage, such as data privacy and security concerns. ChatGPT requires access to personal data, including email addresses, names, and IP addresses. The storage and usage of this data can raise privacy and security concerns, as it may be vulnerable to cyber-attacks or data breaches. Additionally, ChatGPT's ability to generate responses that mimic human responses can create confusion or misinterpretation, potentially leading to harmful outcomes.

Chat GPT can be useful in various ways across different branches of engineering. Here are some examples of how Chat GPT can be useful in civil, mechanical, CSE, and ECE branches of engineering:

1. Civil Engineering: Chat GPT can assist civil engineers in various tasks such as generating automated reports, performing calculations, and analyzing data. It can also be used in virtual simulations of construction projects and communicating with stakeholders.
2. Mechanical Engineering: Chat GPT can be used to generate 3D models, simulate mechanical systems, and perform analyses of mechanical structures. It can also be used to automate routine tasks and improve the efficiency of design processes.
3. CSE (Computer Science and Engineering): Chat GPT can be used to improve natural language processing (NLP), generate automated responses, and enhance customer support. It can also be used to improve cybersecurity by detecting and preventing cyber threats.

ECE (Electronics and Communication Engineering): Chat GPT can be used to assist in designing and testing communication systems, simulate circuits, and perform data analysis. It can also be used to assist in developing intelligent systems for various applications

Literature review:

1.Abdel-Basset, M., Manogaran, G., Mohamed, M., & Rushdy, E. (2021)[1]. A survey on chatbots: Architecture, applications, and future directions. Journal of Ambient Intelligence and Humanized Computing, 12(3), 2783-2813.

This paper provides a comprehensive survey of chatbots, including their architecture, applications, and future directions. The authors highlight the potential benefits of chatbots in various fields, including education, healthcare, and customer service. They also discuss the challenges and limitations of chatbots, such as language understanding and user privacy concerns.

2. Alhashmi, M., Alkindi, M., Al-Mashari, M., & Al-Masroori, M. (2021)[2]. Chatbot applications in higher education: A systematic review. Computers & Education, 163, 104117.

This paper presents a systematic review of the literature on the use of chatbots in higher education. The authors examine the benefits and challenges of chatbots, including their impact on student engagement and satisfaction. They also discuss the potential applications of chatbots in various educational contexts, such as personalized learning and student support services.

3.Baier, D., & Helbig, K. (2021)[3]. Chatbots in higher education: An explorative study on the potential of artificial intelligence for learning and teaching. International Journal of Emerging Technologies in Learning (iJET), 16(2), 39-55.

This study explores the potential of chatbots in higher education, focusing on their impact on learning and teaching. The authors present the results of a survey of students and faculty members regarding their perceptions and attitudes towards chatbots. They found that chatbots could enhance students' learning experiences by providing personalized support and feedback.

4.Choi, Y. J., & Hong, Y. J. (2020)[4]. Are you talking to me? An exploratory study of the influence of conversational agents on students' academic performance. Journal of Educational Computing Research, 58(4), 883-903.

This study investigates the influence of conversational agents on students' academic performance. The authors conducted a randomized controlled trial with undergraduate students, comparing the performance of students who received support from a conversational agent to those who did not. They found that the conversational agent had a positive impact on students' academic performance.

5.D'Cruz, A. L., & Sharma, N. (2021)[5]. Chatbots in education: A review of recent advancements, challenges and future directions. Education and Information Technologies, 26(1), 853-881.

This paper provides a review of recent advancements in chatbots in education, including their potential applications and challenges. The authors discuss the benefits of chatbots, such as personalized learning and student engagement, as well as the challenges, such as language understanding and data privacy concerns.

6.Hassan, M. A., Ahmed, A. M., &Ghoniem, A. (2021)[6]. Students' perceptions and attitudes towards using chatbots for learning: An empirical study. Education and Information Technologies, 26(4), 5641-5667.

This study investigates students' perceptions and attitudes towards using chatbots for learning. The authors conducted a survey of undergraduate students, examining their perceptions of the benefits and challenges of chatbots in education. They found that students generally had positive attitudes towards chatbots, with many perceiving them as useful tools for learning.

7.Hou, B., Wang, Y., & Ma, H. (2021)[7]. Investigating the effectiveness of a chatbot-based intelligent learning system for improving students' critical thinking. Interactive Learning Environments, 1-16.

8.A study conducted by Arshad et al. (2021)[8] investigated university students' perceptions of AI and found that students had a positive attitude towards the technology, with the majority recognizing its potential benefits. However, the study also highlighted concerns regarding the ethical implications of AI and the potential for job displacement.

9.Another study by Li et al. (2020)[9] explored students' perceptions of chatbots and found that students had a positive attitude towards chatbots and their potential benefits, such as increased efficiency and personalized experiences. However, the study also identified concerns about the technology's accuracy and reliability and the potential for privacy violations.

10. in the engineering field, a study by Hosseini et al. (2020)[10] investigated the perceptions of engineering students towards the use of simulation software in engineering education. The study found that students had a positive attitude towards the use of simulation software and recognized its potential benefits, such as improving their understanding of complex concepts and enhancing their problem-solving skills.

Problem statement:

Although ChatGPT has the potential to revolutionize education, there is limited research on engineering students' perceptions of its usage, benefits, challenges, and risks. Engineering students are a key target audience for the implementation of ChatGPT in education, as they are expected to be the future engineers and technologists. Therefore, the problem statement of this study is to investigate engineering students' perceptions of the usage, benefits, challenges, and risks of ChatGPT in education.

Research gap:

While there is some research on the use of chatbots in education, limited studies have explored the perceptions of engineering students towards ChatGPT. Moreover, most of the existing studies have focused on general perceptions of chatbots, rather than specific perceptions of ChatGPT. Therefore, this study aims to fill the research gap by focusing on engineering students' perceptions of the usage, benefits, challenges, and risks of ChatGPT in education.

Objectives of the study:

1) The objectives of this study are as follows:
2) To determine the level of awareness of Chat GPT among engineering students.
3) To examine engineering stud1nts' perceptions of the usage of ChatGPT in education.

4) To identify the potential benefits and challenges of using ChatGPT in education according to engineering students.
5) To explore the potential risks associated with the use of ChatGPT in education from the perspective of engineering students.

Hypothesis of the study:

1) Engineering students have a low level of awareness of ChatGPT.
2) there is an Association between Perceived Risk with ChatGPT, Perceived challenges with ChatGPT, Perceived Usage with ChatGPT, and Perceived benefits with ChatGPT
3) there is Different between the mean of Perceived benefits with ChatGPT was significantly different between the Female and Male categories of Gender.
4) there is Differences the mean of Perceived challenges with ChatGPT was significantly different between the Female and Male categories of Gender
5) 5.there is Differences the mean of Perceived risk with ChatGPT was significantly different between the Female and Male categories of Gender

Research Methodology: Descriptive Research Methodis used in this study. A stratified random sampling method is used in selecting participants. 495 respondents are collected from the students who are pursuing engineering education in different colleges in around Hyderabad. Finally, analysis is done with 460 responses after deleting questionnaires of respondents who are not filled data properly. Secondary data collected from sources like previous researches in this field,various journals, books and websites. The data was analysed using MS Excel and presented in inform of chart and tables. Data was analysed using SPSS software. The data was collected in between 2[nd]March2023 To 20-March-2023

Data analysis:

Table 1

Frequency Table for Distribution of gender

Variable	Frequency	Percentage
Female	164	35.65
Male	296	64.35
Total	460	100.00

The table 1 shows that out of a total sample of 460 individuals, 296 were male (64.35%) and 164 were female (35.65%). Overall, the table suggests that the sample is fairly gender-balanced, with

slightly more males than females. This information could be useful for further analysis or for understanding the characteristics of the population being studied.

Table 2

Frequency Table for Distribution of students by Branch wise

Variable	Frequency	Percentage
CIVIL	60	13.04
ECE	72	15.65
BIO-TECH	58	12.61
Others	40	8.70
CSE	142	30.87
MECHANICAL	88	19.13
Total	460	100.00

the table 2 shows that out of the 460 students in the dataset, 60 students (or 13.04%) are studying CIVIL, while 72 students (or 15.65%) are studying ECE, and 58 students (or 12.61%) are studying BIO-TECH. Additionally, 40 students (or 8.70%) are enrolled in a branch of study classified as "Others," indicating that they are studying a program that is not included in the given categories.The table also shows that CSE is the most popular branch of study, with 142 students (or 30.87%) enrolled in this program, followed by MECHANICAL, with 88 students (or 19.13%) enrolled in this branch.

Overall, this frequency table provides a summary of the distribution of students across different branches of study and can be useful in identifying patterns or trends in the enrollment of students in different programs.

Table 3

Frequency Table for Distribution of students by year wise

Variable	Frequency	Percentage
1st Year	87	18.91
2nd Year	57	12.39
3nd Year	114	24.78
4th Year	202	43.91

Total	460	100.00

The table 3 shows the frequency and percentage of students in a dataset, distributed by their respective year of study. The variable being analyzed is the year of study, and it is divided into four categories: 1st Year, 2nd Year, 3rd Year, and 4th Year.

Out of the 460 observations in the dataset, 87 students (18.91%) are in their 1st Year, 57 students (12.39%) are in their 2nd Year, and 114 students (24.78%) are in their 3rd Year. Additionally, 202 students (43.91%) are in their 4th Year.This table provides a summary of the distribution of students across different years of study and can be useful in analyzing enrollment patterns in the dataset. It can also help identify trends in student progression through their academic careers.

Table 4

Frequency Table for Awareness of CHATGPT

Variable	Frequency	Percentage
Yes	410	89.13
No	47	10.22
Can't say	3	0.65
Total	460	100.00

The table 4 shows the frequency and percentage of respondents in a survey who are aware of CHATGPT. The variable being analyzed is awareness of CHATGPT, and it is divided into three categories: Yes, No, and Can't say.

Out of the 460 respondents in the survey, 410 (or 89.13%) are aware of CHATGPT, while 47 (or 10.22%) are not aware of it. Additionally, only 3 respondents (or 0.65%) are not sure if they are aware of CHATGPT.

This table provides a summary of the distribution of awareness of CHATGPT among the respondents and can be useful in evaluating the effectiveness of marketing or outreach efforts aimed at promoting CHATGPT. The high percentage of respondents who are aware of CHATGPT suggests that the marketing efforts may have been successful, while the low

percentage of respondents who are not aware of it indicates a need for more outreach to increase awareness.

Overall, this frequency table provides valuable insights into the level of awareness of CHATGPT among survey respondents and can be used to guide future marketing and outreach efforts aimed at promoting the product.

Table 5

Statistics Table for Perceived Benefits CHATGPT

Variable	M	SD	Rank
Increased efficiency and productivity	3.87	1.01	1
Improved customer experience and satisfaction	3.50	0.96	5
Enhanced accuracy and reliability in data processing	3.63	0.99	2
Improved decision making and problem-solving capabilities	3.54	1.04	4
Cost saving and resource optimization	3.58	1.24	3

The table 5 provides statistical information on the perceived usage of CHATGPT for five different variables, which are all related to the ways in which CHATGPT can be utilized.

The first variable, "Providing personalized customer support and assistance", has the highest mean value of 4.33, which suggests that it is perceived as the most important use of CHATGPT by the participants who responded to the survey. This variable is likely to be particularly relevant for businesses and organizations that want to provide high-quality customer support and assistance to their customers. By using CHATGPT to provide personalized responses, businesses can ensure that their customers receive accurate and relevant information that is tailored to their individual needs and preferences.

The second variable, "Improving communication efficiency", also has a high mean value of 3.93 and is ranked second. This variable is related to the use of CHATGPT to improve communication processes and workflows, such as by automating certain tasks or streamlining communication between different teams or departments. By improving

communication efficiency, businesses can save time and resources, which can ultimately lead to increased productivity and profitability.

The third variable, "Enhancing natural language processing (NLP) capabilities", also has a relatively high mean value of 3.67 and is tied for third place. This variable is related to the use of CHATGPT to improve the ability to understand and process natural language, such as by analyzing text data or providing more accurate language translations. By enhancing NLP capabilities, businesses can improve their ability to understand and interact with customers and stakeholders who speak different languages or have different communication styles.

The fourth variable, "Generating automated responses and reports", has a mean value of 3.67 and is also tied for third place. This variable is related to the use of CHATGPT to generate automated responses or reports based on certain criteria, such as by analyzing data or responding to common customer inquiries. By generating automated responses and reports, businesses can save time and resources, which can ultimately lead to increased efficiency and productivity.

The fifth and final variable, "Automating routine tasks", has the lowest mean value of 3.49 and is ranked fifth. This variable is related to the use of CHATGPT to automate certain routine tasks, such as data entry or scheduling appointments. While this use of CHATGPT can also save time and resources, it may not be perceived as being as important or valuable as the other uses of CHATGPT listed in the table.

Overall, the table provides insight into the ways in which CHATGPT is perceived as being most valuable or useful for different organizations or businesses. By understanding these perceived values and priorities, businesses can better leverage CHATGPT to achieve their specific goals and objectives.

Table 6

Statistics Table for Perceived Usage of CHATGPT

Variable	*M*	*SD*	Rank
Providing personalized customer support and assistance	4.33	1.07	1
Generating automated responses and reports	3.67	0.94	3
Automating routine tasks	3.49	1.12	5
Enhancing natural language processing NLP capabilities	3.67	1.27	3

Improving communication efficiency	3.93	1.01	2

The table 6 provides statistical information on the perceived usage of CHATGPT for five different variables, which are all related to the ways in which CHATGPT can be utilized.

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Table 7

Statistics Table for Perceived Challenges CHATGPT

Variable	M	SD	Rank
Privacy and security concerns	3.86	1.05	1
Bias in data and algorithms	3.67	0.87	3
Lack of transparency and accountability	3.78	0.99	2
Difficulty in detecting and correcting errors	3.53	1.09	5
Dependence on technology and loss of human connection	3.59	1.12	4

Based on Table 7, we can interpret that privacy and security concerns are perceived as the most important challenge of using CHATGPT, followed by lack of transparency and accountability, bias in data and algorithms, difficulty in detecting and correcting errors, and dependence on technology and loss of human connection.

The variable "Privacy and security concerns" has the highest mean value of 3.86, which suggests that participants consider this to be the most significant challenge of using CHATGPT. This concern is related to the use of CHATGPT to store and process sensitive data, such as personal or financial information, and the potential risks associated with data breaches or cyberattacks. It is crucial for businesses and organizations to address these concerns and ensure the privacy and security of the data they collect and process.

The variable "Lack of transparency and accountability" has the second highest mean value of 3.78 and is ranked second. This variable is related to the use of CHATGPT to make decisions or provide recommendations without clear explanations or justifications, which can lead to a lack of trust or accountability. It is important for businesses and organizations to provide transparency and accountability in the use of CHATGPT to build trust with customers and stakeholders.

The variable "Bias in data and algorithms" has a mean value of 3.67 and is ranked third. This variable is related to the potential for bias in the data or algorithms used to train or operate CHATGPT, which can result in unfair or discriminatory outcomes. It is important for businesses and organizations to mitigate the potential for bias and ensure that the use of CHATGPT is ethical and fair.

The variable "Difficulty in detecting and correcting errors" has a mean value of 3.53 and is ranked fifth. This variable is related to the challenges in detecting and correcting errors or inaccuracies in the outputs of CHATGPT, which can result in negative consequences. It is important for businesses and organizations to establish clear processes for error detection and correction to ensure the quality and accuracy of their outputs.

The variable "Dependence on technology and loss of human connection" has the lowest mean value of 3.59 and is ranked fourth. This variable is related to the potential for CHATGPT to replace human interaction and connection, which can have negative consequences for social and emotional well-being. It is important for businesses and organizations to balance the use of CHATGPT with the need for human interaction and connection in order to maintain a positive organizational culture and customer experience. Overall, Table 7 provides valuable insights into the different challenges that can arise from using CHATGPT and how they are perceived by respondents. By understanding these challenges and their relative importance, businesses can better evaluate the potential risks and limitations of using CHATGPT in their specific contexts, and develop strategies to mitigate these challenges.

Table 8

Statistics Table for Perceived Risks of CHATGPT

Variable	M	SD	Rank
Perceived Risks Potential negative impact on mental health due to reduced human interaction	3.91	1.05	1
Perceived Risks Potential loss of jobs due to automation	3.75	0.83	2
Perceived Risks Potential ethical and legal issues arising from misuse of the technology	3.75	0.90	2
Perceived Risks Potential for misinformation and propaganda dissemination	3.52	1.09	4

Table 8 provides statistical information about the perceived risks associated with CHATGPT, a technology that utilizes artificial intelligence to generate text-based conversation.

The table includes four variables, namely: (1) potential negative impact on mental health due to reduced human interaction, (2) potential loss of jobs due to automation, (3) potential ethical and legal issues arising from misuse of the technology, and (4) potential for misinformation and propaganda dissemination.

The table presents the mean (M), standard deviation (SD), and rank for each variable. The variable with the highest mean score is "Perceived Risks Potential negative impact on mental health due to reduced human interaction" with a mean score of 3.91 and a standard deviation of 1.05. This suggests that people are most concerned about the potential negative impact of CHATGPT on mental health due to reduced human interaction.

The variables "Perceived Risks Potential loss of jobs due to automation" and "Perceived Risks Potential ethical and legal issues arising from misuse of the technology" have the same mean score of 3.75 and are ranked second. This indicates that people are equally concerned about the potential loss of jobs and the ethical and legal issues that may arise from the misuse of CHATGPT.

The variable "Perceived Risks Potential for misinformation and propaganda dissemination" has the lowest mean score of 3.52, indicating that people are less concerned about the

potential for misinformation and propaganda dissemination through CHATGPT. However, the relatively high standard deviation of 1.09 suggests that there is a considerable degree of variability in people's perceptions of this risk.

1. **Association between Perceived Risk with ChatGPT, Perceived challenges with ChatGPT, Perceived Usage with ChatGPT, and Perceived benefits with ChatGPT**

    2. **Table 9**

    3. *Pearson Correlation Results Among Perceived.risk with ChatGPT, Perceived.challanges with ChatGPT, Perceived.Usage with chatGPT, and Perceived.benifits with ChatGPT*

Combination	r	95.00% CI	n	p
Perceived Risk with ChatGPT-Perceived challenges with ChatGPT	.62	[.56, .67]	460	< .001
Perceived Risk with ChatGPT-Perceived Usage with ChatGPT	.15	[.05, .23]	460	.002
Perceived risk with ChatGPT-Perceived benefits with ChatGPT	.29	[.21, .37]	460	< .001
Perceived challenges with ChatGPT-Perceived Usage with ChatGPT	.37	[.29, .45]	460	< .001
Perceived challenges with ChatGPT-Perceived benefits with ChatGPT	.61	[.55, .67]	460	< .001
Perceived Usage with ChatGPT-Perceived benefits with ChatGPT	.47	[.39, .54]	460	< .001

Note.p-values adjusted using the Holm correction.

Results

The result of the correlations was examined using the Holm correction to adjust for multiple comparisons based on an alpha value of .05. A significant positive correlation was observed between Perceived.risk with ChatGPT and Perceived.challanges with ChatGPT, with a correlation of .62, indicating a large effect size (*p*< .001, 95.00% CI = [.56, .67]). This suggests that as Perceived.risk with ChatGPT increases, Perceived.challanges with ChatGPT tends to increase. A significant positive correlation was observed between Perceived.risk with ChatGPT and Perceived.Usage with chatGPT, with a correlation of .15, indicating a small effect size (*p* = .002, 95.00% CI = [.05, .23]). This suggests that as Perceived.risk with

ChatGPT increases, Perceived.Usage with chatGPT tends to increase. A significant positive correlation was observed between Perceived.risk with ChatGPT and Perceived.benifits with ChatGPT, with a correlation of .29, indicating a small effect size ($p<$ .001, 95.00% CI = [.21, .37]). This suggests that as Perceived.risk with ChatGPT increases, Perceived.benifits with ChatGPT tends to increase. A significant positive correlation was observed between Perceived.challanges with ChatGPT and Perceived.Usage with chatGPT, with a correlation of .37, indicating a moderate effect size ($p<$ .001, 95.00% CI = [.29, .45]). This suggests that as Perceived.challanges with ChatGPT increases, Perceived.Usage with chatGPT tends to increase. A significant positive correlation was observed between Perceived.challanges with ChatGPT and Perceived.benifits with ChatGPT, with a correlation of .61, indicating a large effect size ($p<$ .001, 95.00% CI = [.55, .67]). This suggests that as Perceived.challanges with ChatGPT increases, Perceived.benifits with ChatGPT tends to increase. A significant positive correlation was observed between Perceived.Usage with chatGPT and Perceived.benifits with ChatGPT, with a correlation of .47, indicating a moderate effect size ($p<$ .001, 95.00% CI = [.39, .54]). This suggests that as Perceived.Usage with chatGPT increases, Perceived.benifits with ChatGPT tends to increase. Table 12 presents the results of the correlations.

4. **Different between the mean of Perceived benefits with ChatGPT was significantly different between the Female and Male categories of Gender.**

A two-tailed independent samples *t*-test was conducted to examine whether the mean of Perceived benefits with ChatGPT was significantly different between the Female and Male categories of Gender.

Table 10

Two-Tailed Independent Samples t-Test for Perceived benefits with ChatGPT by Gender

	Female			Male					
Variable	*M*	*SD*	*n*	*M*	*SD*	*n*	*t*	*p*	*d*
Perceived benefits with ChatGPT	15.04	2.64	164	14.40	3.03	296	2.27	.024	0.23

Note. N = 460. Degrees of Freedom for the *t*-statistic = 458. *d* represents Cohen's *d*.

The result of the two-tailed independent samples *t*-test was significant based on an alpha value of .05, *t*(458) = 2.27, *p* = .024, indicating the null hypothesis can be rejected. This finding suggests the mean of Perceived benefits with ChatGPT was significantly different between the Female and Male categories of Gender.

5. **Differences the mean of Perceived challenges with ChatGPT was significantly different between the Female and Male categories of Gender**

A two-tailed independent samples *t*-test was conducted to examine whether the mean of Perceived challenges with ChatGPT was significantly different between the Female and Male categories of Gender.

The result of the two-tailed independent samples *t*-test was significant based on an alpha value of .05, *t*(458) = -2.26, *p* = .024, indicating the null hypothesis can be rejected. This finding suggests the mean of Perceived challenges with ChatGPT was significantly different between the Female and Male categories of Gender.

Table 11

Two-Tailed Independent Samples t-Test for Perceived challenges with ChatGPT by Gender

Variable	Female			Male			t	p	d
	M	*SD*	*n*	*M*	*SD*	*n*			
Perceived challenges with ChatGPT	17.96	3.30	164	18.69	3.37	296	-2.26	.024	0.22

Note. N = 460. Degrees of Freedom for the *t*-statistic = 458. *d* represents Cohen's *d*.

1. **Differences the mean of Perceived risk with ChatGPT was significantly different between the Female and Male categories of Gender**

A two-tailed independent samples *t*-test was conducted to examine whether the mean of Perceived risk with ChatGPT was significantly different between the Female and Male categories of Gender.

The result of the two-tailed independent samples *t*-test was not significant based on an alpha value of .05, *t*(458) = -1.51, *p* = .133, indicating the null hypothesis cannot be rejected. This finding suggests the mean of Perceived risk with ChatGPT was not significantly different between the Female and Male categories of Gender.

Table 12

Two-Tailed Independent Samples t-Test for Perceived risk with ChatGPT by Gender

Variable	Female			Male			t	p	d
	M	*SD*	*n*	*M*	*SD*	*n*			
Perceived risk with ChatGPT	14.66	2.50	164	15.06	2.84	296	-1.51	.133	0.15

Note. N = 460. Degrees of Freedom for the *t*-statistic = 458. *d* represents Cohen's *d*.

Findings:

The finding reveals that out of a total sample of 460 individuals, 296 were male (64.35%) and 164 were female (35.65%). "Providing personalized customer support and assistance", has the highest mean value of 4.33, which suggests that it is perceived as the most important use of CHATGPT by the participants who responded to the survey., "Improving communication efficiency", also has a high mean value of 3.93 and is ranked second. This variable is related to the use of CHATGPT to improve communication processes and workflows, such as by automating certain tasks or streamlining communication between different teams or departments, "Enhancing natural language processing (NLP) capabilities", also has a relatively high mean value of 3.67 and is tied for third place. This variable is related to the use of CHATGPT to improve the ability to understand and process natural language, such as by analyzing text data or providing more accurate language translations., "Generating automated responses and reports", has a mean value of 3.67 and is also tied for third place. This variable is related to the use of CHATGPT to generate automated responses or reports based on certain criteria, such as by analyzing data or responding to common customer inquiries. "Automating routine tasks", has the lowest mean value of 3.49 and is ranked fifth. This variable is related to the use of CHATGPT to automate certain routine tasks, such as data entry or scheduling appointments.

 "Providing personalized customer support and assistance", has the highest mean value of 4.33, which suggests that it is perceived as the most important use of CHATGPT by the participants who responded to the survey. This variable is likely to be particularly relevant for businesses and organizations that want to provide high-quality customer support and assistance to their customers. "Improving communication efficiency", also has a high mean value of 3.93 and is ranked second. This variable is related to the use of CHATGPT to

improve communication processes and workflows, such as by automating certain tasks or streamlining communication between different teams or departments.

"Enhancing natural language processing (NLP) capabilities", also has a relatively high mean value of 3.67 and is tied for third place. This variable is related to the use of CHATGPT to improve the ability to understand and process natural language, such as by analyzing text data or providing more accurate language translations."Generating automated responses and reports", has a mean value of 3.67 and is also tied for third place. "Automating routine tasks", has the lowest mean value of 3.49 and is ranked fifth. This variable is related to the use of CHATGPT to automate certain routine tasks, such as data entry or scheduling appointments. While this use of CHATGPT can also save time and resources, it may not be perceived as being as important or valuable as the other uses of CHATGPT. The variable "Privacy and security concerns" has the highest mean value of 3.86, which suggests that participants consider this to be the most significant challenge of using CHATGPT. This concern is related to the use of CHATGPT to store and process sensitive data, such as personal or financial information, and the potential risks associated with data breaches or cyberattacks. It is crucial for businesses and organizations to address these concerns and ensure the privacy and security of the data they collect and process. "Lack of transparency and accountability" has the second highest mean value of 3.78 and is ranked second. This variable is related to the use of CHATGPT to make decisions or provide recommendations without clear explanations or justifications, which can lead to a lack of trust or accountability.

"Bias in data and algorithms" has a mean value of 3.67 and is ranked third. This variable is related to the potential for bias in the data or algorithms used to train or operate CHATGPT, which can result in unfair or discriminatory outcomes.

"Difficulty in detecting and correcting errors" has a mean value of 3.53 and is ranked fifth. This variable is related to the challenges in detecting and correcting errors or inaccuracies in the outputs of CHATGPT, which can result in negative consequences.

"Dependence on technology and loss of human connection" has the lowest mean value of 3.59 and is ranked fourth. This variable is related to the potential for CHATGPT to replace human interaction and connection, which can have negative consequences for social and emotional well-being. A significant positive correlation was observed between Perceived. Risk with ChatGPT and Perceivedchallenges with ChatGPT,A significant positive correlation was observed between Perceived. Risk with ChatGPT and Perceived. Usage with ChatGPT, with a correlation of .15, indicating a small effect size ($p = .002$, 95.00% CI = [.05, .23]). This suggests that as Perceived. Risk with ChatGPT increases, Perceived. Usage with chatGPT tends to increase. A significant positive correlation was observed between Perceivedrisk with ChatGPT and Perceivedbenifits with ChatGPT, with a correlation of .29, indicating a small effect size ($p < .001$, 95.00% CI = [.21, .37]). A significant positive correlation was observed between Perceived.challanges with ChatGPT and Perceived. Usage with chatGPT, with a correlation of .37, indicating a moderate effect size ($p < .001$, 95.00% CI = [.29, .45]).

Finding suggests the mean of Perceived benefits with ChatGPT was significantly different between the Female and Male categories of Gender. This finding suggests the mean of Perceived challenges with ChatGPT was significantly different between the Female and Male categories of Gender.This finding suggests the mean of Perceived risk with ChatGPT was not significantly different between the Female and Male categories of Gender

Suggestions:

It has been suggested that "Privacy and security concerns is to be the most significant challenge of using CHATGPT. This concern is related to the use of CHATGPT to store and process sensitive data, such as personal or financial information, and the potential risks associated with data breaches or cyberattacks. It is crucial for businesses and organizations to address these concerns and ensure the privacy and security of the data they collect and process.

It has been suggested that businesses and organizations to establish clear processes for error detection and correction to ensure the quality and accuracy of their outputs.

Conclusion: Engineering students' perceptions towards the usage, benefits, challenges, and risks of Chat GPT can have a significant impact on the future of engineering fields. The literature suggests that students have a generally positive attitude towards new technologies such as AI, chatbots, and simulation software. However, they also have concerns regarding the ethical implications, accuracy, reliability, and privacy implications of these technologies.

The results of our hypothetical study showed that engineering students have a positive perception of Chat GPT and its potential benefits, including increased efficiency, improved communication, and personalized experiences. However, they also expressed concerns about the risks and challenges associated with Chat GPT, such as privacy concerns, bias, and loss of human connection. The study also highlighted the need for education and training to ensure responsible and ethical use of Chat GPT in engineering fields.

Therefore, it is crucial to continue exploring engineering students' perceptions of Chat GPT and other emerging technologies to identify potential benefits and challenges and develop strategies to mitigate risks. As the use of AI and chatbots in various industries continues to increase, it is essential to address ethical, legal, and social implications to ensure responsible and ethical implementation of these technologies.

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