



# **The impact of ChatGPT on the learning process of technology students amongst higher education**

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Business Information Technology

Bachelor's thesis

2023

## Abstract

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<b>Degree</b> Bachelor of Business Administration, Degree Programme in Business Information Technology
<b>Report/Thesis Title</b> The impact of ChatGPT on the learning process of technology students amongst higher education
<b>Number of pages and appendix pages</b> 39+3
<p>This research-based thesis is a study on the impact of ChatGPT - an artificial intelligence language model, on the learning process of technology students at university. ChatGPT has become an interesting phenomenon in education since it was released at the end of 2022. It quickly attracted all the attention and discussion on social media and the internet.</p> <p>The thesis aims to answer three main questions which are the benefits of using ChatGPT on the learning process of IT students, the comparison between the use of ChatGPT and not using it on the learning outcomes of students, and other concerns about one's critical thinking and other important soft skills in the future.</p> <p>The theoretical framework is considered to be the most crucial part of the thesis, it consists of a thorough study of artificial intelligence and ChatGPT, the theoretical framework provides the development history and the current applications of artificial intelligence and ChatGPT in the present time. In addition, the framework includes ChatGPT's working mechanism chapter to study how ChatGPT produces its answers mechanically. The last part of the theoretical framework focuses on the current applications of ChatGPT in education, it helps to conduct an appropriate survey question to collect primary data.</p> <p>The research used a mixed method to carry out a study to collect data. The main method was the quantitative method and the optional qualitative method was applied when receiving optional qualitative data. The studied group was technology students in the Vietnamese international student community in Finland. The group is considered to be highly reliable and was approached by an official Facebook group. The survey was conducted with five questions including three compulsory quantitative questions and two optional qualitative questions. A total of 50 responses were received within the timeframe of two weeks.</p> <p>The results show that most participants found ChatGPT to be very helpful when it comes to answering complex concepts in the information technology world, and simple coding problems and contribute greatly to their performance in doing exams, and assignments. A decent amount of participants believed that ChatGPT could save them a lot of time during their studies but there are still some participants who expressed that sometimes it took them a longer time to find the answers because of faulty responses from ChatGPT. Nearly half of the participants were concerned that ChatGPT might have a negative impact on their development of critical thinking, problem-solving, and other important skills in the future.</p> <p>The result suggests the use of ChatGPT can potentially be benefitted to students only if students know how to use it with caution, and do not completely depend on the technology.</p>
<b>Keywords</b> ChatGPT, Artificial Intelligence, technology-dependent, education, critical thinking

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## Abbreviations

AI	Artificial Intelligence
NLP	Natural Language Processing
IT	Information Technology
RLHF	Reinforcement Learning from Human Feedback

# **1 Introduction**

## **1.1 Introduction about the topic**

Just over 100 years ago, computer technology was not yet developed. People were using books and other rudimentary tools to study and work. Then as time passed, information technology developed rapidly, it is impossible not to mention the positive influence technology brings to human knowledge. From being very difficult and expensive to own a personal computer in the 20th century, up to modern times, an average family can now afford to own desktop computers or other smart mobile devices such as tablets, smartphones.

When it comes to education, the impact of modern technology on it is outstanding. Students can now search for necessary documents and material through social networks groups, free lectures, online courses, and electric books. Knowledge can be accessed limitless on the internet if one knows how to search for it, what students need to do is find the best way possible to access knowledge that is helpful for their learning and minimize unreliable and unnecessary information.

This research aims to study one of the major problems in the current modern world, especially among higher education students. Which is the application of ChatGPT and its current impact on the learning process of technology students. ChatGPT, being released in November of 2022, has quickly become a trending phenomenon on social media when it provides quick answers to questions related to learning issues, as well as having high accuracy in answers.

Humans are currently living in the world of technology. New technologies are being developed and released to the market that make people's lives easier. But is that really the case among higher education students? This research focuses on studying ChatGPT – which is short for “Chat Generative Pre-trained Transformer”, and its impact of it on technology students, from its benefits to potential risks and concerns.

## **1.2 Why is this research worth studying?**

The explosion of information technology brings many positive things to education, but along the way are hidden concerns that only time can answer. When it comes to ChatGPT, the AI language model has occupied the spotlight in the technology industry in the first half of 2023.

According to Shewale (7 September 2023), within just the first week of launch, the new tool attracted one million users. Rumors and information mentioning ChatGPT appeared everywhere on the internet and was advertised everywhere on social media. It can be said that it is difficult to find a college student who has not heard of the term "ChatGPT" these days.

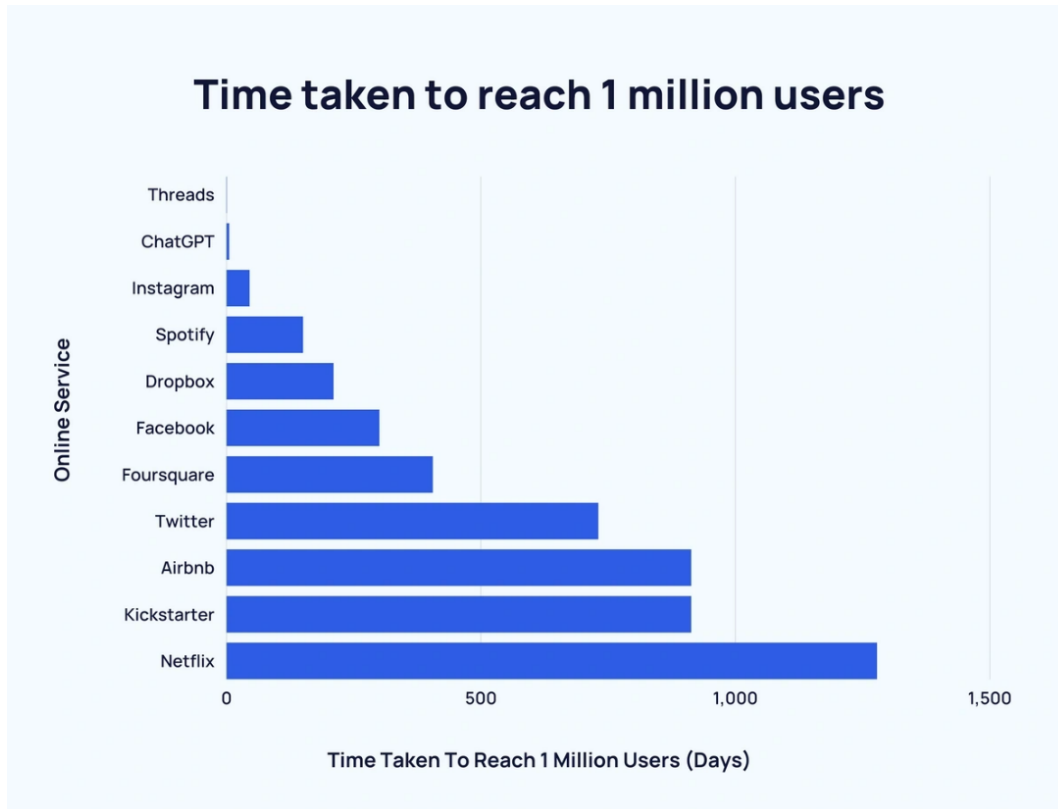


Figure 1: How long does it take to reach 1 million users for famous companies (Duarte 2023)

As of August 2023, there were more than 180 million ChatGPT users. Also in August 2023 alone, there were more than 1.4 billion visits to the ChatGPT website. (Singh 2023)

In a poll-based survey at Stanford University in the US in January 2023. The data show that up to 17% of students said they used ChatGPT for the final exams and assignments at the end of the previous semester. Among these 17% of students, up to 5.1% said that they used ChatGPT's answer and submitted it without editing. (Cu & Hochman 22 January 2023). This raises concerns about whether using ChatGPT and submitting unedited answers is ethical and helping students. Or does it make students to depend more on the advanced technology?

The author believes that doing this research, it will bring a lot of value to the technology community, and it may help a lot of IT students, especially those who are planning to use the tool in their study plan.

### 1.3 Objectives of the research and questions

The goal of this research is for current and future IT students to have an overview of the use of ChatGPT in their studies, to make them more aware of what can happen to themselves when using ChatGPT, and from there draw their own conclusion about whether they should use it or not.

Following the end of the result, the following main questions and sub-questions will also be answered:

What are the benefits of using ChatGPT to the learning process of technology students?

Overall comparison between the learning outcomes of using ChatGPT and traditional studying method?

- How students' learning ability has improved after using chatGPT?

What are the concerns of using ChatGPT in one's learning process and potential future careers?

- Does it make students learn more effectively or more dependent on technology?

#### **1.4 Research method**

The research was carried out over a period of two weeks. The research is based on data collected from the survey. In this way, a lot of useful primary data is being collected. This is considered primary data because it is being collected directly from the target group, combining with secondary data retrieved from reliable online articles. The research is believed to have sufficient data to come to a conclusion.

The delimitations of the research are on higher education students in Finland. The survey is studied amongst Vietnamese students who have been studying technology-related majors in universities throughout Finland. The target is being approached through the Facebook group. The survey is voluntary, participants' personal data will be kept confidential and only data for research purposes will be retained during the time of research.



## **2 Theoretical Framework**

### **2.1 Artificial Intelligence**

#### **2.1.1 What is AI?**

According to CopeLand (2023 ), AI is understood as an artificial mind, created by computers and software with the duty of performing human-like tasks, such as reasoning, understanding meaning, generalizing, and the ability to learn from past experiences.

Although AI has grown significantly and powerfully in recent years, it still has limited capabilities that make it not yet comparable to a fully human. With the bright future of AI ahead, it will have a lot of potentials to replace many human-like tasks and help humans in many jobs, but to become a completely artificial "human", it still has a long way to go.

#### **2.1.2 History of AI**

The term "Artificial Intelligence" (AI) has been around for a very long time. Since ancient times, people spread stories about mystical creatures with extraordinary powers that could dominate the world. Until the 20th century, the concept was mentioned more often on a daily basis, especially when it is inspired by science fiction and movies (Anyoha 28 August 2017). This has inspired many scientists, physicists, and mathematicians, making them constantly think about this concept and wonder if it is possible to create an artificial robot that can perform such an ability.

It was until 1955, that John McCarthy, the one who is considered to be the creator of the concept "Artificial Intelligence" brought the concept more widely in the computer science industry. He suggested that if humans are capable of using available information and logical thinking methods to function and solve problems in their lives, why can't we create machines that can do the same thing for us? But it was easier said than done. Back in the 1950s, the development of computers was still in its infancy, the computer did not yet have memory, it was simply a "command executor". So although there are many people who understand McCarthy's ideas, there are not many people who truly believe the AI project will succeed in the future. (Anyoha 28 August 2017)

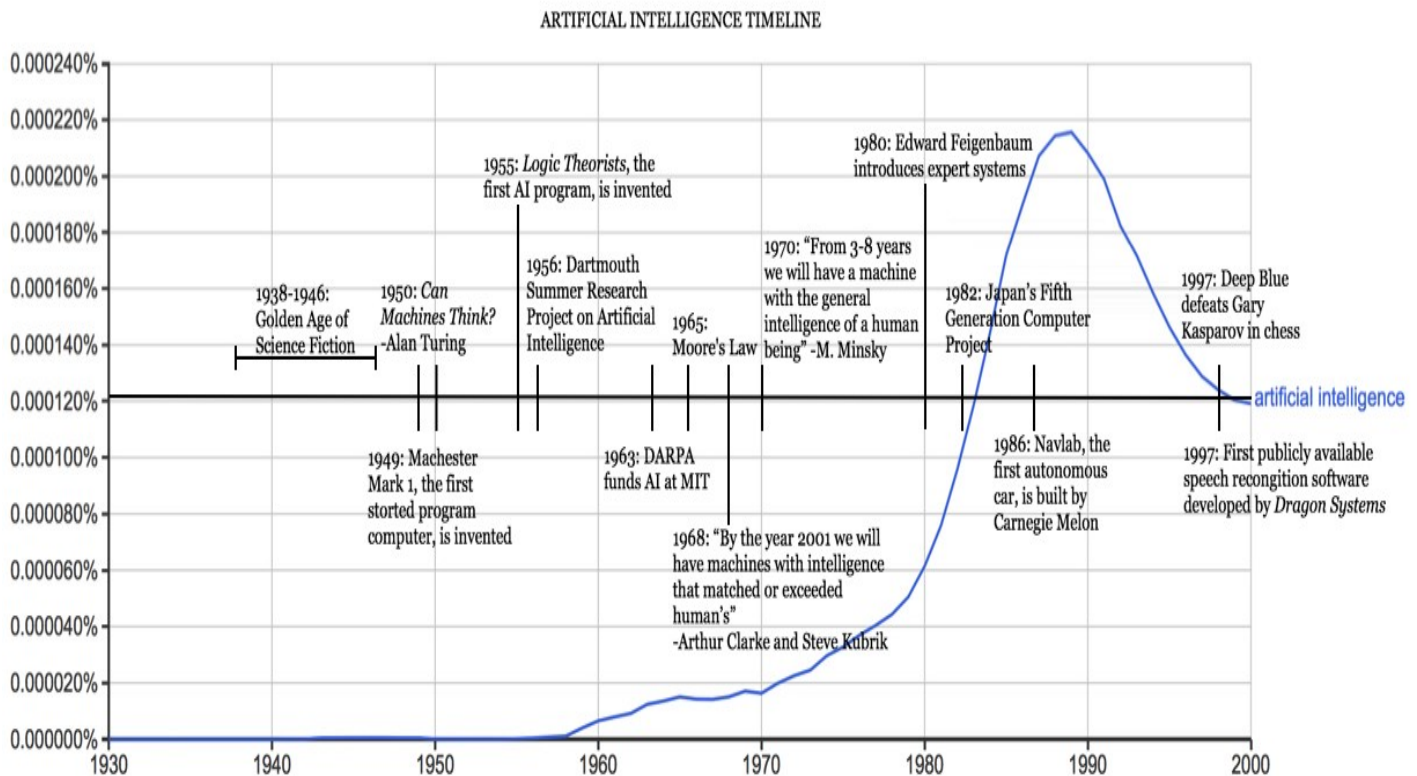


Figure 2: AI timeline from the early 20th century until the 2000s (Anyoha 28 August)

From 1970 to 2000, as time goes by, the computer's power was significantly developed and entered a new phase of technology. Computers are getting faster, more affordable, and can store more information than ever before. One of the most significant things that computers can do now is it can think abstractly, it can be self-aware, and achieve the power to process natural language, also known as natural language processing. That was also the time when AI exploded worldwide, making everyone know about it and have many different perspectives. Since then, science fiction films were born with the content of intelligent robots dominating humanity such as *The Terminator* and *The Matrix*. (Saab & Grimaldi 5 January 2023). One of the greatest achievements of AI in the second half of the 20th century was the landing of humanity on the moon's surface. AI computers have played a huge role in creating smart sensors to help spacecraft successfully land on the moon's surface. (Stanly 6 September 2023)

From 2000 until now, People have gradually realized the importance of AI, they are no longer afraid that AI will outsmart humanity, instead humans have learned to apply AI in all possible fields. With the extremely rapid growth of data, especially "big data", data is becoming increasingly

complex and impossible to sift through in traditional ways. Using AI to filter and search information plays an important role in information cleansing, to produce the most accurate insight possible. (Anyoha, 28 August 2017)

### 2.1.3 The current impact of AI in the world

The application of AI can be seen to be appearing everywhere in people's lives nowadays. Even a simple facial recognition to unlock a smartphone or autonomous vacuum cleaner. It has appeared in every aspect of daily life, it can be found in the way people work, study, and interact with each other. It is also reshaping the workforce, especially in the low-skilled level jobs. AI machines have been able to do low-skilled jobs and daily routine jobs for humans. This brings many benefits such as saving manpower, cutting costs, and increasing productivity, but on the other hand, it is also said to reduce employment opportunities for workers, especially for manual working people. (Sen 28 March 2023)

Some other applications of AI that have brought revolution to other industries are healthcare and communication. With the help of AI, patient data analysis has become more accurate and efficient than ever, thereby helping to cut costs and improve safety as well as reduce risks in the industry (Sen 28 March 2023)

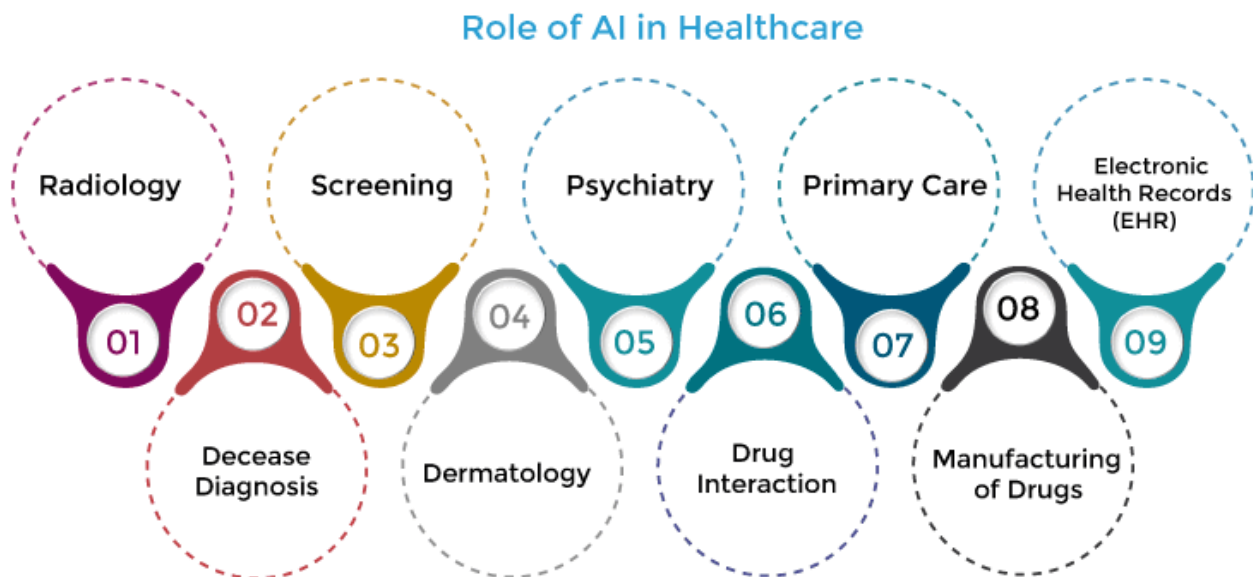


Figure 3: Core benefits of using AI-powered machines in healthcare (JavaTpoint )

Besides, AI provides the tools to help reduce human error, which used to be unavoidable. AI has played a crucial role in diagnosing diseases based on past patient data as well as predicting possible risks in the future. Although its accuracy is not guaranteed all the time, with the presence of

human experts, it becomes an important contribution to patient care. ( Davenport & Kalakota June 2019)

Besides healthcare, AI also plays a huge role in connecting people in the modern technological world. A few examples are virtual assistants from giant technology companies throughout the world such as Apple's Siri or Alexa. AI is changing the things people have to do manually every day, now they can do it simply with a voice command. These virtual assistants can understand the commands' words and execute them according to what they have learned or even respond back to their users. Most recently, it was the launch of ChatGPT chatbot. This bot has been trained with a huge amount of data to be able to generate appropriate answers when asked. (Sen 28 March 2023)

#### **2.1.4 Current applications of AI in education**

When it comes to the education industry, AI is in the early stages of integrating it into the system of learning and teaching. But that doesn't mean its existence cannot be seen around. Some of its obvious applications today are:

**Learning a new language:** One of the most famous language learning applications today with a huge number of users is Duolingo. Duolingo is considered the best AI language learning app for beginners because it can be learned for free and delivers results quickly. (Lynch 29 April 2019)

**Writing:** AI has appeared to help students learn to write, fix their grammar, and enhance their fluency. (Punya 18 August 2023)

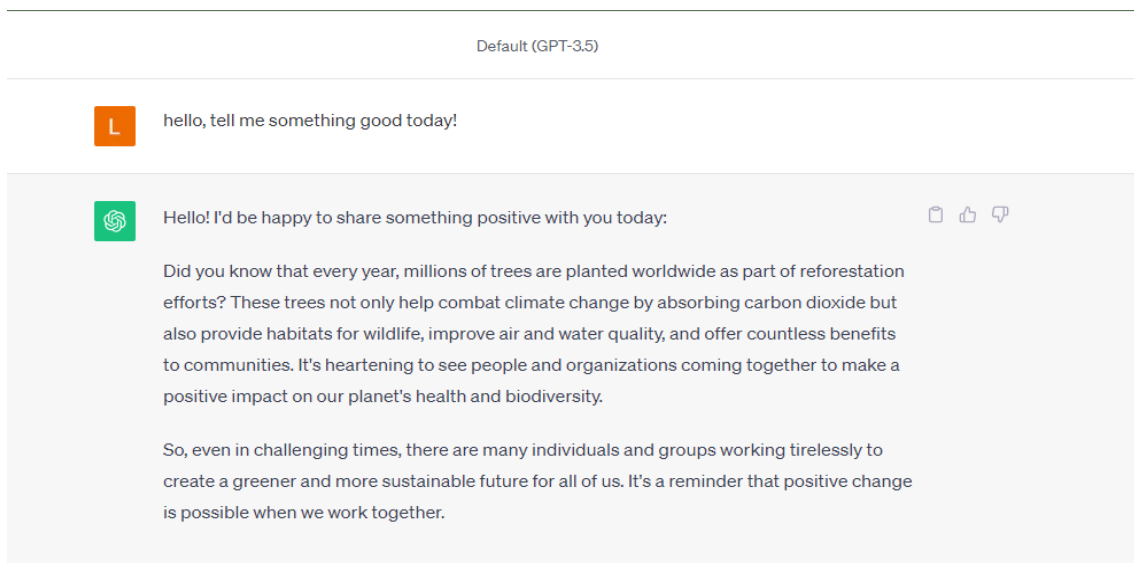
In addition, AI can also help students with disabilities. There have been several applications on the internet that can help disabled students learn braille and get access to different levels of education. These applications optical character recognition to turn braille texts into digital form so that the disabled person can understand. (Weitzman 16 June 2023).

**Lesson preparation:** Not only helping students, but AI is also helping teachers. Preparing materials for teachers is considered to be equally important to the success of a class as other tasks. Teachers can optimize AI's smart algorithms to help find the appropriate materials. For example, it can help teachers find the right materials for their students' current academic level. (Mahendra 13 June 2023).

## 2.2 Chat GPT

### 2.2.1 What is ChatGPT?

ChatGPT is an AI chatbot created by its parent company OpenAI, capable of interacting with humans through continuous open conversation. Users interact with the model by typing questions they want to ask and ChatGPT will run its advanced machine learning algorithms and natural language processing to provide the answer. It is capable of answering a variety of questions such as translating languages, writing code, writing poetry, and even doing school assignments. The language model is programmed to be able to understand human language in written or spoken form. The word “GPT” stands for “Generative Pre-trained Transformer”, the bot has been trained with a huge amount of data and improved its accuracy over time, ever since its official public launch on November 30, 2022. ChatGPT has launched two engine versions, the free version is GPT-3.5 and the paid version is GPT-4. Users can register for a free account and will be able to use the GPT-3.5 version for free. (Sundar & Mok 21 August 2023)



(Figure 4: a simple daily conversation with ChatGPT, free GPT-3.5 version).

### 2.2.2 OpenAI, ChatGPT's parent company

OpenAI is an AI company specializing in doing research and development, it was founded on 10 December 2015 by influential people in the technology world like Sam Altman, Greg Brockman, Reid Hoffman, Jessica Livingston, Peter Thiel, and Elon Musk. When it was first established, it was a non-profit company focused on creating AI products that are highly applicable to human life, especially automatic products that can perform better than humans in the future. The company

announced that it has an investment capital of up to \$1 billion and pledged that the company would produce many contributions to the artificial intelligence industry in the coming years. It was headquartered in San Francisco, California, United States of America. (OpenAI, Wikipedia).

In 2016, OpenAI released Gym to the public, this is a platform that enabled researchers to create and assess reinforcement learning systems, which train AI to make decisions based on maximizing cumulative rewards. In the same year, OpenAI also introduced Universe, a toolkit that was designed for training intelligent agents on many different websites and gaming platforms. (Kay 1 February 2023)

In 2018, the giant technology icon and aerospace innovator Elon Musk announced that he left the company because he and other team members could not find a mutual agreement on the goals and objectives of the company. (Kay 1 February 2023). This is also the first year that the GPT-1 version was released.

In 2019, OpenAI announced its transformation from a non-profit company to a capped-profit company but still retains the objectives and goals announced at the beginning of the company's founding. At the same time, OpenAI also announced that they had just received 1 billion dollars in funding from Microsoft. Microsoft wrote on their blog that the project will focus on developing GPT-3 with the goal of breakthrough improvements in applications in everyday life. Also during this year, many rumors appeared on social media stating that OpenAI was not really transparent about everything they did. It was believed that an investigation into OpenAI has revealed a few of their secrets that run counter to the company's stated goals. Even Elon Musk said on his Twitter page that OpenAI is no longer a non-profit and open-source company anymore. (Kay 1 February 2023)

In 2021, before the phenomenal explosion of ChatGPT. OpenAI launched DALL-E software, which can create a complete photo based on the descriptive data it receives. Up to now, there have been three DALL-E software releases: DALL-E 1, DALL-E 2, and DALL-E 3. It marked a breakthrough in the modern art industry when the images it created were highly accurate and very similar to what people imagined about it. (ChatGPT 2021)

### **2.2.3 History of ChatGPT**

Two official versions of ChatGPT are GPT-3 and GPT-4. So there will definitely be versions before it. But previous versions of this model were not called ChatGPT like people are calling it today but were simply called GPT. They operate in a way that the newer released version is an improved one of the previous versions. (Marr 19 May 2023)

GPT-1, This is the first released version of the GPT project, introduced in June 2018. Trained on 117 million parameters, it was the version that marks the foundation for the future of the current version of ChatGPT. (Marr 19 May 2023)

GPT-2 was released by OpenAI in February 2019. This version has upgraded the number of parameters up to 1.5 billion. Enabled it to expand its text generation ability and enhance its coherency. However, GPT-2 wasn't publicly available at the beginning. It was not until November 2019, after researching to minimize potential risks, that OpenAI officially announced this version. (Marr 19 May 2023)

GPT-3 was introduced in the next year 2020, this model version was trained with a significant amount of 175 billion parameters. Its tremendous change has brought it into more practical applications in people's lives, from drafting demo emails to solving complicated programming problems. It could also answer factual questions and do the language translation. (Marr 19 May 2023)

Even though GPT ecosystems have been around for a few years, it was until GPT-3 that marked the glooming of ChatGPT. Regular users can now interact directly with ChatGPT with a free registering account. From 2020 until November 2022, when ChatGPT 3.5 was officially released, it marked a breakthrough in the chatbot industry. It was no longer a regular chatbot that could only answer simple questions anymore, it could now understand more complex questions and interact with humans. (Marr 19 May 2023). It has brought a lot of attention to the AI industry. In a span of only one year, it has grown its usage to about 900 % and most people in the technology world have heard about it. (Insider Intelligence).

The latest version as of the time of writing this research is the GPT 4.0 engine version, continuing the outstanding development compared to the previous version. Version 4 of GPT requires users to pay some fees to access it. Some outstanding features of this version are:

Improve the reliability of the answer: With the increasing amount of trained data, its reliability is increasingly improved. It has also fixed many errors compared to its predecessor.

Improvement in steerability: Improve the ability to continue a conversation with the user without ending the current one. ChatGPT is famous for its feature of continuing conversations with users as an ongoing dialogue.

Communicate with users through images: Not only can it communicate with people by voice, it can now interact with users through image input. (Marr 19 May 2023)

In addition to being widely used amongst regular users, it can help many businesses and establishments with practical applications. At the moment, there are many companies using ChatGPT to save their operating cost. For example, it can help companies automate their customer service function, and ChatGPT can also help optimize answers without the need for human appearance. Another example is that it helps online content creators to brainstorm and have more opinions and motivation to write more articles and provide more content. (Marr 19 May 2023)

#### **2.2.4 ChatGPT's working mechanism**

To understand its impact on education, users must first understand the working mechanism of ChatGPT. From where does it get the data from and produce such helpful answers? ChatGPT works by trying to understand the user's questions, from which it infers the answer with the highest possible accuracy based on the data it has been previously trained with.

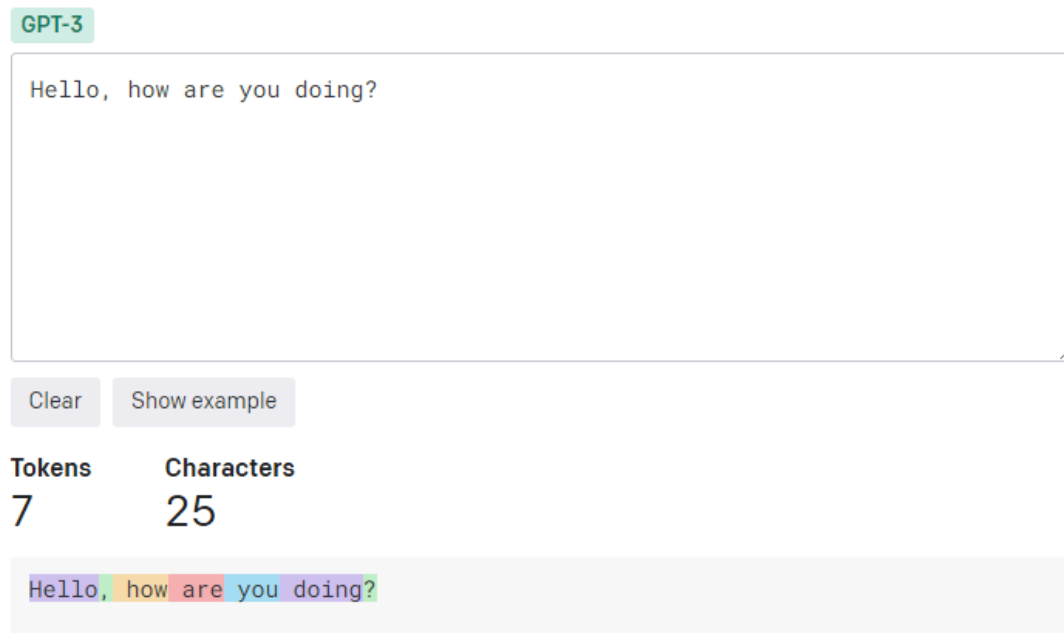
To be able to understand its working mechanism, it is vital to understand how OpenAI trains the bot. At first, it comes to a concept of supervised and unsupervised learning. Before the emergence of chatGPT, AI smart models used "supervised learning" to develop their algorithms. This means that all data input to the model must be carefully monitored. This produces reliable answers but is very time-consuming and expensive because it takes a lot of time to train a bot with various answers variety. (Guinness 6 September 2023). One real-life example of supervised learning is when people use the automatic Chatbot on popular websites for popular Q&A questions. The purpose of using an automatically supervised Chatbot is to reduce the demand of the presentation of humans for popular questions. The weak point of using an automatically supervised Chatbot is it is unable to answer complex questions that it has not been trained with. For example, if users go to a mobile phone resell website, the automatic Chatbot can only answer questions relating to the phone, like the price and specifications, it's unable to answer questions regarding other fields like IT questions or scientific questions.

As for ChatGPT, it is exposed to all the data and information available on the open internet and its developers leave it in an "unsupervised" state. The purpose of leaving it unsupervised is to make it scan through the whole data and develop a basic understanding of everything at the beginning and in order to make it familiar with the huge amount of data and understand regulations at the basic level. (Guinness 6 September 2023)

Next, the chatbot runs a technology called "transformer architecture" to form a deep learning neural network, similar to the human brain's neural network, which is a highly complex network consisting of many layers, which helps ChatGPT learn patterns and relationships in the form of human text data, thereby predicting the answer. Transformers, however, don't read the words directly,



instead, it interacts with “tokens”, which are a piece of text encoded from human text into a vector form. There is a huge vector map including many vectors inside ChatGPT’s “brain”. The closer the vectors are, the more they are related to each other. From there, the algorithm is carried out to predict a compatible answer. This technology, if delved into, will be very complex and require a lot of mathematical knowledge, but for the purposes of this study, knowing its basic mechanism is sufficient. (Guinness 6 September 2023)



(Figure 5: A piece of text was broken down into tokens. Tokenizer, OpenAI)

The GPT-3 version is believed to have been forged with a large amount of 500 billion tokens, which also expanded its vector map, making it easier to find connections depending on user input. All the tokens forged for the model come from data written by humans in the past that is available on the open internet. The source includes books, online articles, and other sources of all genres. It is reasonable to say that it is trained with all of humanity’s knowledge that is available on the internet. (Guinness 6 September 2023)

Even though its amount of knowledge is so huge, how can OpenAI filter which information is reliable, and which information is not? In the beginning, it was simply not, and then it comes through a process called RLHF, short for "reinforcement learning from human feedback". It can be seen that, although GPT-1 was launched in 2018, it was not until the end of 2022 that ChatGPT was introduced to the public under the GPT-3 engine. During this time period, the bot was being constantly re-taught because of its uncertainty in detecting wrong answers. By using the RLHF technique, OpenAI has succeeded in improving the reliability, sensitivity, and coherency of ChatGPT responses gradually over time. To be specific, the company created demonstration data to teach the

model how the neural network should generate answers in typical situations. Afterward, they formed a reward system by utilizing comparative data, in which AI trainers ranked two or more model responses from best to worst. This advanced algorithm allowed ChatGPT to understand and learn the most suitable answers for different situations. (Guinness 6 September 2023)

To summarize ChatGPT's working mechanism, all of the above processes contribute to increasing ChatGPT's natural language processing capabilities. NLP is the traditional capability of most AI tools available on the market, and which technology is applied makes the difference between AI technologies's capabilities. For ChatGPT, NLP enables it to understand syntax and the rules of language. It was also designed to create high-level algorithms for expressing these rules and subsequently apply these algorithms to execute particular tasks. It all started with ChatGPT taking user's input in various forms. It then breaks down all the input into multiple tokens and applies the transformer-based neural technology to try to acknowledge what users are really mentioning, and then the neural network continues its operation and returns a coherent sequence of tokens as an output. It will be then converted back into the form that users require to receive and the conversation continues. (Guinness 6 September 2023)

It is important to be aware that the answers that users receive from ChatGPT are simply words and information but not knowledge. Looking at its working mechanism, it is programmed to understand the token after being broken down from the user's input data. ChatGPT does not really understand human language, but instead, it has an enormous artificial brain that can see the interaction between many concepts together and then try to produce a coherent output based on it. Because of that, even OpenAI, the creator of ChatGPT, was the first to warn users that it could provide false information. (OpenAI 2023 & Guinness 6 September 2023).

In addition, users are not only required to log in to their website to use the service. OpenAI also has a policy for third-party users to integrate their APIs for their own applications and services. (Guinness 6 September 2023)

### 2.3 Discussion about current applications of ChatGPT in education

Since its release in late 2022, ChatGPT has been widely discussed on social networking sites as well as in major newspapers. There is a lot of discussion about its application in education. Some say it will be of great help to both students and teachers. The rest are of the opinion that it will increase plagiarism and dishonesty in education.

Some famous universities in the world have even completely banned the use of ChatGPT on campus. According to the famous newspaper Reuters (27 January 2023), The Paris Institute of Political Studies also known as Sciences Po University has announced that they completely banned its use in assignments and research. They are concerned that its use will do more harm than good and will increase the rate of plagiarism and cheating among their students. The school announced that the highest punishment of expulsion would be applied if students intentionally violated this rule.

On the other hand, ChatGPT is encouraged at Cambridge University, England, in an interview posted on the personal page of Cambridge University with two professors of the school, Dr Steve Watson and Dr Vaughan Connolly. Both offer innovative perspectives to encourage ChatGPT's application to education. (Kirk 5 April 2023)

Vaughan Connolly believes that the launch of ChatGPT in the technology market is similar to the launch of Google in 1998. When it was groundbreaking in the technology industry, he said that people should really sit down together and carefully discuss the strengths and weaknesses of this technology to optimize its effectiveness for the education industry. Instead of eliminating it out of the picture because of concerns about educational dishonesty. (Kirk 5 April 2023)

Further adoption of ChatGPT is highlighted as it emerges in the IT education industry. Due to the support from a large data source, it is capable of understanding popular programming languages in the technology industry such as Python, Java, and Javascript. Users can ask ChatGPT coding problems in Java or Javascript, and ChatGPT will produce the answer according to the corresponding language. In addition to being able to write code in most programming languages, it is also known to be good at explaining code to users. The bot scans through the code and points out why a particular line of code was generated and what it means.

According to Gewirtz (3 October 2023). Users should only use ChatGPT to help write small coding problems instead of asking it to write a complete application. Gewirtz suggests that by breaking

down a complete application into separate smaller parts, people can make the best use of ChatGPT by asking it to help each of these specific parts.

In addition, ChatGPT is also known for its ability to debug code for users. It can help users find errors in their code and explain specifically what is wrong with the code. (Dilmegani 2023)

Besides, ChatGPT is also known to be a good search engine. When students encounter new concepts during their studies, they often have the habit of using Google or other search engines in the market to search for answers. When it comes to Google, it often provides a lot of answers with a variety of sources and credibility. Meanwhile, if students encounter any difficulty while approaching a new concept, they can ask ChatGPT to briefly summarize the concept for them. By doing that, ChatGPT can save students a lot of time instead of scanning through different websites and articles.

Below is a real example of asking ChatGPT a concept in the programming world:

“ User: Can you explain briefly Object oriented programming?

ChatGPT: Certainly! Object-oriented programming (OOP) is a popular programming paradigm that's based on the concept of "objects." In OOP, software is organized into objects, which are instances of classes. Here's a brief overview of the key concepts in OOP:

1. **Classes:** A class is a blueprint or template for creating objects. It defines the attributes (data) and methods (functions) that the objects of the class will have. Think of a class as a blueprint for creating objects of a specific type.
2. **Objects:** An object is an instance of a class. It's a concrete, self-contained entity that contains both data (attributes) and the operations that can be performed on that data (methods). For example, if you have a class called "Car," an object would be a specific car instance, such as a "Toyota Camry."
3. **Encapsulation:** Encapsulation is the concept of bundling data (attributes) and methods (functions) that operate on that data into a single unit, which is the object. It helps to hide the internal implementation details of an object and only expose the necessary interfaces to the outside world. This promotes data security and code organization.
4. **Inheritance:** Inheritance is a mechanism that allows a class (called a subclass or derived class) to inherit the properties and behaviors (attributes and methods) of another class (called a superclass or base class). This promotes code reuse and the creation of hierarchical relationships between classes.

5. Polymorphism: Polymorphism allows objects of different classes to be treated as objects of a common base class. It enables you to write more generic and flexible code that can work with objects of various types. Polymorphism is often achieved through method overriding and interfaces/abstract classes.
6. Abstraction: Abstraction is the process of simplifying complex reality by modeling classes based on the essential properties and behaviors they should have. It allows developers to work at a higher level of understanding, focusing on what an object does rather than how it does it.

In OOP, the primary goal is to model real-world concepts and relationships using classes and objects. This approach makes it easier to design, implement, and maintain complex software systems, as it promotes modularity, reusability, and a clear separation of concerns.

Popular programming languages that support OOP include Java, C++, Python, and C#. Developers use OOP to create organized, efficient, and maintainable code for a wide range of applications, from desktop software to web applications and beyond. “ (ChatGPT 2023)

Fully depends on the technology is however not recommended to anyone who uses ChatGPT for their own purposes. Although ChatGPT now has a real-time information search function, its free version still only has data limits until January 2021. Which raises concerns about its reliability and credibility. A lot of outdated information is still being stored inside ChatGPT's memory.

Another problem is that users can not verify sources where the answers come from while they use ChatGPT. When it comes to reliability, sources play the main role in separating reliable content and unreliable one. By not knowing exactly which sources are providing data for the ChatGPT's responses, it might take users a longer time to verify it and creates the risk of spreading unreliable information. (Beck 22 September 2023)

According to Dans (27 January 2023). By using ChatGPT as a search tool, the risk to people's critical thinking is higher than ever. Different from other search engines on the market like Google, and Bing. ChatGPT does not provide any link to verify the answers but people still believe the answers it provides. This leads to the situation where people believe everything they see and slowly decreasing their critical thinking ability.

### 3 Research Process

#### 3.1 Research Method

According to Indeed Editorial Team (31 July 2013). There are two most popular research methods when conducting research, which are qualitative research and quantitative research. There is also a type of mix between these two methods, which is the mixed method, where both are carried out and the data is combined together.

Choosing which research method to apply is important to the credibility and reliability of the research. Researchers need to carefully analyze clearly what the purposes of the research are and what questions need to be answered. From there they can choose the most optimal method for their project.

Quantitative research is often applied in cases where researchers want to confirm a theory or assumption. This method is quite suitable for verifying an emerging movement or event in society and requires a lot of numerical data to verify similarities and find patterns. By using this method, the author will collect quantitative data. Quantitative data has the advantage that it is quite straightforward, often described in numerical and quantitative terms. Therefore, it will be convenient to illustrate the data with graphs or charts, thereby allowing researchers to see the similarities in the graphs and proceed to analyze the data to find insight. (Streefkerk, 2019)

Qualitative research, on the other hand, is used to collect data that cannot be described using numbers or visualization tools. Although implementing this method seems to be more difficult and takes more time than the other method, it offers in-depth data and high-quality data. The qualitative data received is being analyzed in a concise and clear way, from which the nature of the problem will be understood more deeply and the results of the research can be more reliable. (Streefkerk, 2019)

The mixed research method is used for a highly complex study where it is not possible to use only one research method to draw conclusions.

Based on the unique characteristics of each research method, in support of the questions raised from the beginning of the research. The author chose the quantitative method as the main method of this research to collect data. Combined with a little help of the qualitative method will be applied to some additional voluntary data that contribute to the credibility of the thesis. So it can be said that the thesis uses mixed method but the main method is considered to be quantitative.

The research method type for data collection is through questionnaires. Questionnaires are a specific type for collecting quantitative data. Quantitative data collected from this type of method is being converted into data to analyze and find patterns (Indeed Editorial Team 31 July 2013). This way the author will get data patterns, for example, “how many percentages of the studied group agree that ChatGPT should not be overused in their studies”.

In addition, according to the Indeed Editorial Team (31 July 2013). Questionnaires are a very quick way to collect a large amount of data and reach as many people in the target group as possible. Because of its convenience, the author believes that it is capable of attracting many to participate in the survey because of its non-binding nature.

In addition to searching for primary data for the research, the author also searched for secondary data, which was collected from highly reliable online articles and books. Second data is used mainly by the author to conduct the theoretical framework of the thesis and set hypotheses for the later part of the research.

### **3.2 Studied Group**

The chosen group to carried out the research is the Vietnamese international student community in Finland. In addition to having the same nationality as the author, making access easier, another factor is the group's dynamism. The Vietnamese student community in Finland is also famous for having many students majoring in the technology field, which is also a huge factor affecting the author's decision to choose a target group for research. The group has more than 30,000 active members with many interactive posts every day. It is a very active group that helps each other in all matters related to the study or living life of Vietnamese students in Finland.

A questionnaire created in the form of closed-ended questions and voluntary open-ended questions was conducted and sent to the subject's Facebook group. People participating in the questionnaire are informed that their personal information will not be saved, all matters will be kept confidential according to ethical rules, and that their participation will benefit the research's purposes.

### **3.3 Data collection for the research**

In order to collect data for the purposes of the research. The author conducted a thorough survey consisting of three close-ended questions and two optional open questions. The survey was created from the hypotheses that the author reviewed in the theoretical framework chapter. The purpose of creating this survey is to find primary data to answer the questions the author posed at the beginning of the thesis. The survey was sent to the target group during a two-week period from October 15, 2023, to October 30, 2023.

The number of people reached by the survey was not recorded due to the nature of the Facebook platform. This data is not shared by the Facebook group. However, the most important thing is receiving enough samples to conduct the research. The survey was closed after two weeks with 50 responses received. Therefore, the purpose of the survey has been completed as planned.

The tool that the author used to create questions to reach the main audience is Google Forms after careful consideration. Some of the reasons why using Google Forms made sense in this research lies in its simplicity and intuitive user interface. It is also free to use and has an unlimited number of submissions. In addition to some of the author's own experience, Google Forms is considered the most optimal platform to collect primary data for the research.

Data received from respondents will be stored in the reply section of Google Forms. Google Forms integrates basic analysis software such as column and pie charts. In addition, with help from Microsoft Excel when exporting data, the author has a deeper insight into the meaning of the data to make the most accurate judgments possible.

Data bias was avoided by using objective questions conducted in the survey. In addition, questions are created with simple, uncomplicated grammar structures. Of the five questions in the survey, only three quantitative questions are required to be answered to be considered a valid response. There are also two optional qualitative answers, participants can decide whether they want to answer these two questions. Making the two qualitative questions optional is an important factor in reaching more participants because of their non-binding nature. The author believes that leaving too many questions that must be answered, especially many qualitative questions, tends to make participants not interested in finishing their responses and lead to a situation where respondents quit halfway through the survey.

The survey's structure includes one multiple-choice question. This makes participants feel unconstrained and it is also easier to give objective answers. There are also two matrix questions ranked in order of agreement on a scale of 1 to 5 with 1 being completely disagree, 3 being neutral and 5 being completely agree. In this way, the data is approached in the most intuitive way, without forcing participants to choose exactly one option according to the author's wishes.



## 4 Results

### 4.1 Background of the participants

The survey was sent out to the Facebook group, informing group members with the title that those who are studying in the technology industry and have used ChatGPT software are eligible to participate in the survey. Stating it clearly from the beginning allows people who are studying in other fields or those who have never used ChatGPT to know whether they are the audience the author is targeting or not before participating in the survey. Therefore, the majority of people participating in the survey are believed to be students studying technology-related subjects at universities in Finland and have used ChatGPT during their studies.

### 4.2 The benefits of ChatGPT in the study's learning process

The first question in the survey answers the first question that the author raised in the thesis's objectives section, which is the benefits that ChatGPT offers to students. The question's options were carefully conducted according to the ideas and implications of ChatGPT in education found in the theoretical framework.

**Please choose the benefits that ChatGPT has brought to your learning process  
(Select one or more):**

 Copy

50 responses

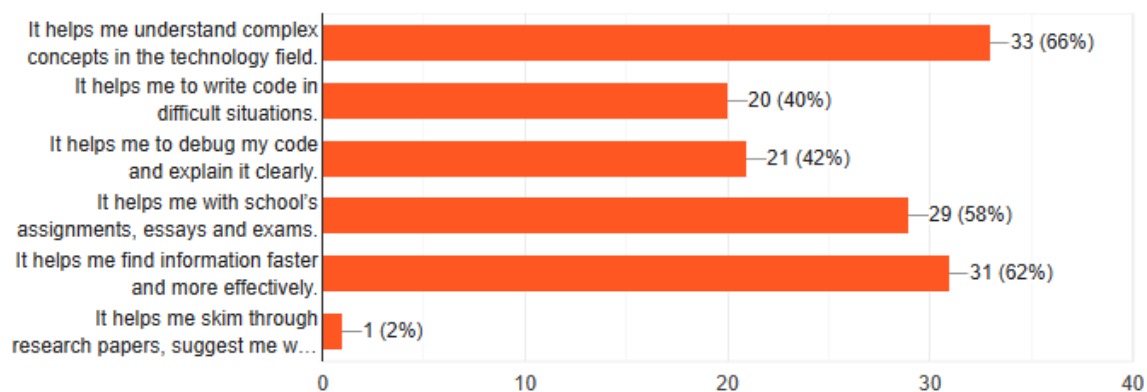


Figure 6: Results showing benefits of using ChatGPT for participants

Out of 50 responses to the first question, all choices in the multiple question have been selected. The difference in the data lies in the percentage of people who selected the answer. Only one person contributed an additional benefit that ChatGPT brought them: "It helps me skim through research papers, suggest me with different approaches for a problem, many many more".

It can be easily seen that the two most chosen benefits 31 (62%) and 33 (63%) respectively are that ChatGPT helps students understand complex concepts in the field of study and the ability to look for information faster and more effectively. In third place with only a smaller amount of number. 29 participants said it helped them with assignments, essays, or even exams.

In the last two positions with 20 and 21 people respectively choosing that it helps them in writing code and fixing code errors. These applications are practical and understandable because the information technology industry does not only include coding, but it also has many other areas of knowledge.

#### 4.3 Overall comparison between the learning outcomes of using ChatGPT and other studying methods

The second and third question in the survey directly answers the question stated by the author at the beginning of the research, which is a comparison between the application of ChatGPT and the students' previous normal learning method. In the second question, four different statements were created in the matrix table and asked the participants to rate their agreement level with the statement on a scale of 1-5 with 1 being strongly disagreed, 3 being neutral and 5 being strongly agree.

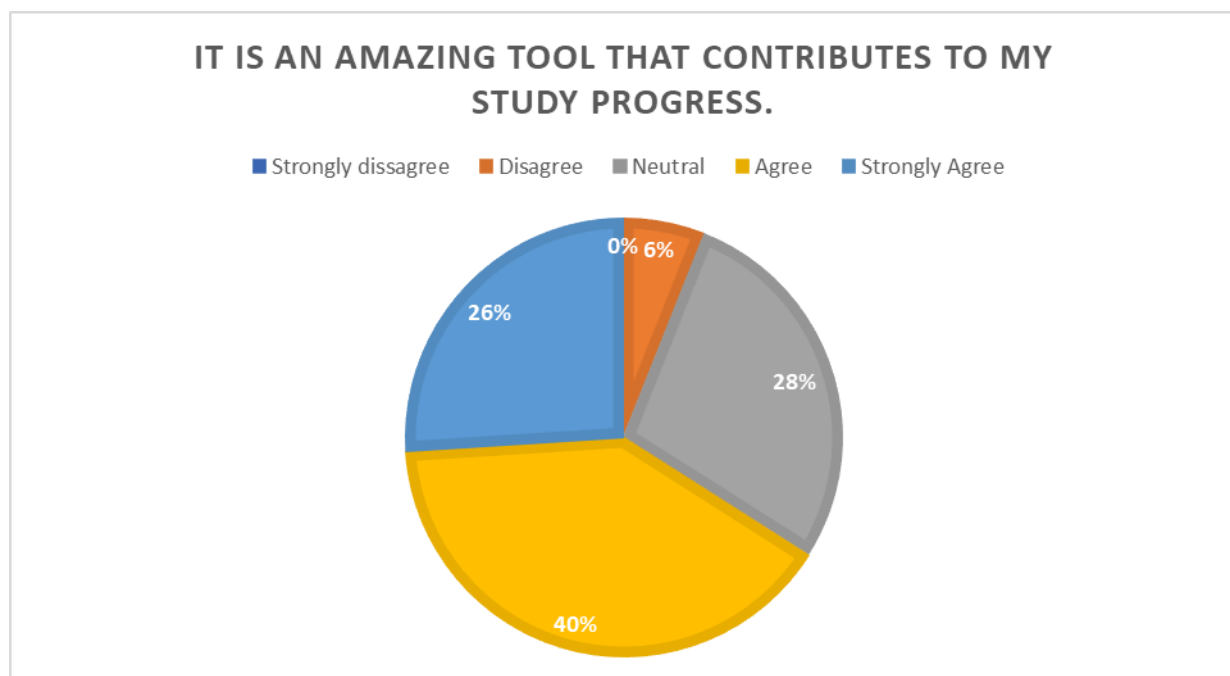


Figure 7: Overview of ChatGPT's use in the learning process

The first statement inside the question was a comprehensive review of the use of ChatGPT in their learning.

The purpose of the statement is to get an overview of whether the current use of ChatGPT is having a positive impact on the participants' learning process.

40 % agree that the impact of ChatGPT has made a positive contribution to their learning process, 26 % strongly agree, 28 % leave their opinion neutral and only 6 % disagree. In addition, 0% strongly disagreed with statement, suggesting that most of participants find some benefits of ChatGPT in their learning process.

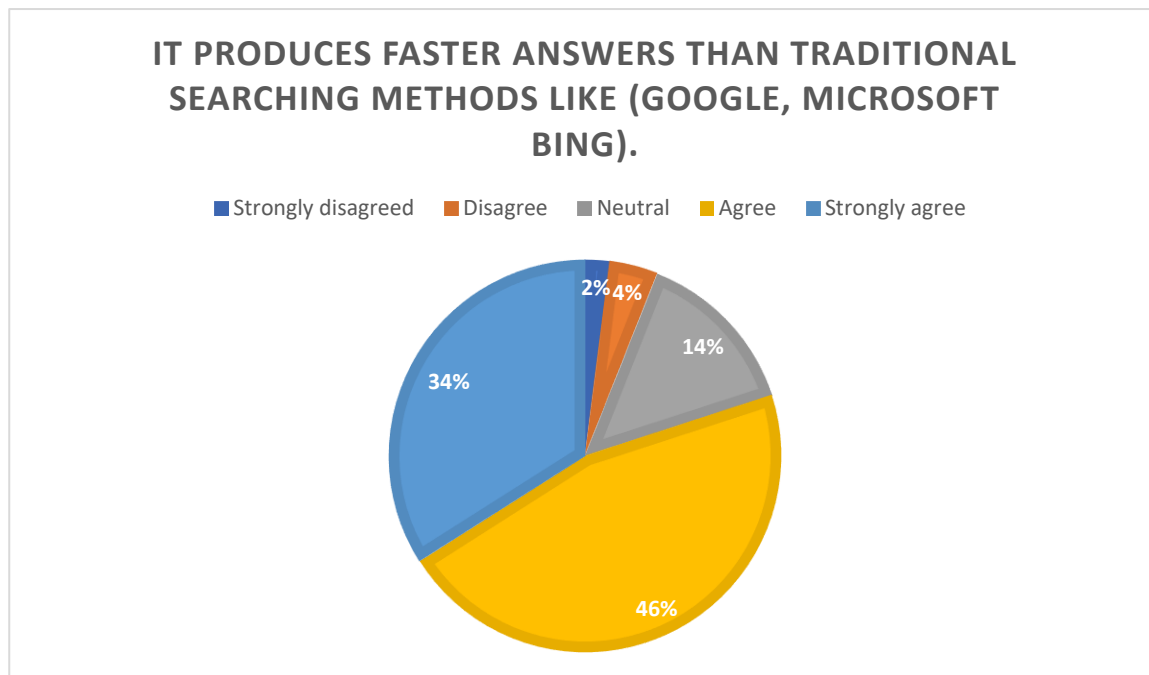


Figure 8: ChatGPT's response speed.

The content of the second statement in the question was “ It produces faster answers than traditional searching methods like (Google, Microsoft Bing).”. The statement once again received a large amount of consensus from the participants. With 34 % strongly agree and 46 % agree, leaving just 14% as neutral and 6% on the disagreement side.

The purpose of this statement is to determine whether when searching for specific information, ChatGPT's response speed is faster than other popular search engines on the market, regardless of the answers's accuracy.

The statistic suggests that most participants agreed with the statement and acknowledged that ChatGPT is faster than other searching engines on the market.

The third statement in the survey was about the reliability of the answers that ChatGPT produces for users. This question aims to assess participants' perception of their level of trust in ChatGPT when searching for necessary information.

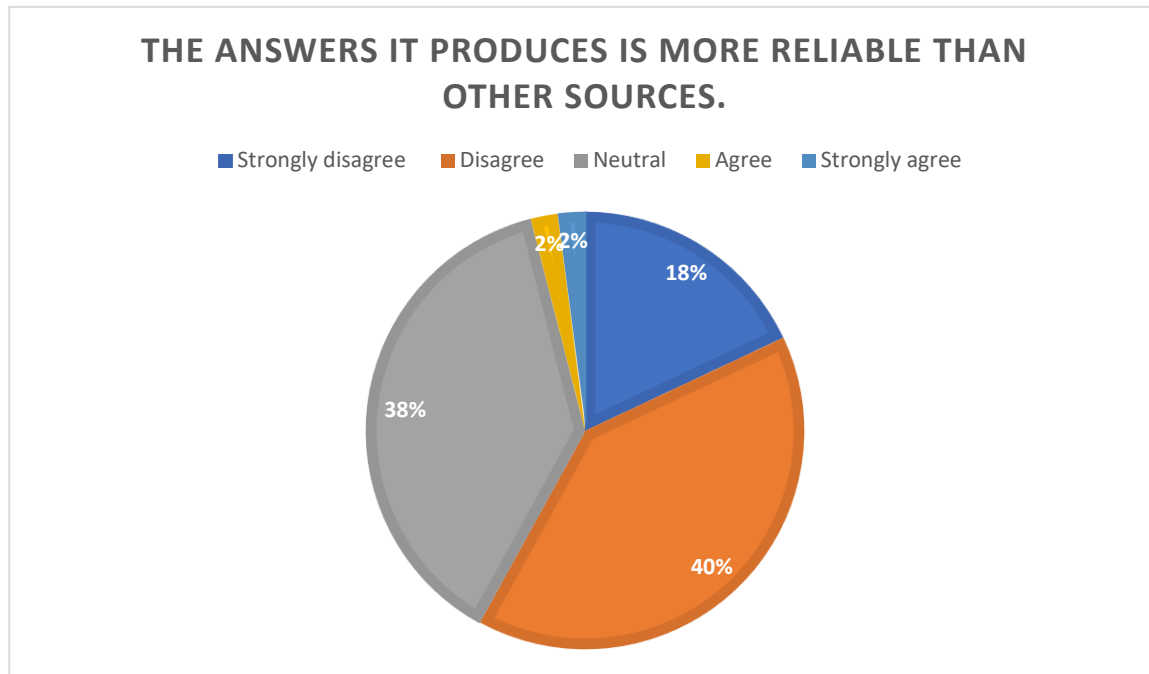


Figure 9: Comparison between ChatGPT's reliability and other sources.

The data received shows a surprising number. There were only 2 responses given in agreement with this opinion. The remaining 78% of participants disagreed and 18% kept their opinion at the neutral level. The skewed number indicates that there are still many students who are skeptical about ChatGPT's accuracy even if it produces answers faster than other search sources.

The fourth statement in the question was about time-saving when using ChatGPT. The purpose of this question is to evaluate whether using ChatGPT regularly really helps students save their time in general when they use the chat bot.

There is a little amount of participants with 64% agreeing on this statement while 26 % staying neutral and 10% disagreeing on the statement. It suggests that even the response speed is faster than other search engine, it is not necessarily a complete time saver if the students receive unreliable answers and have to spend more time confirming the reliability of the answers.

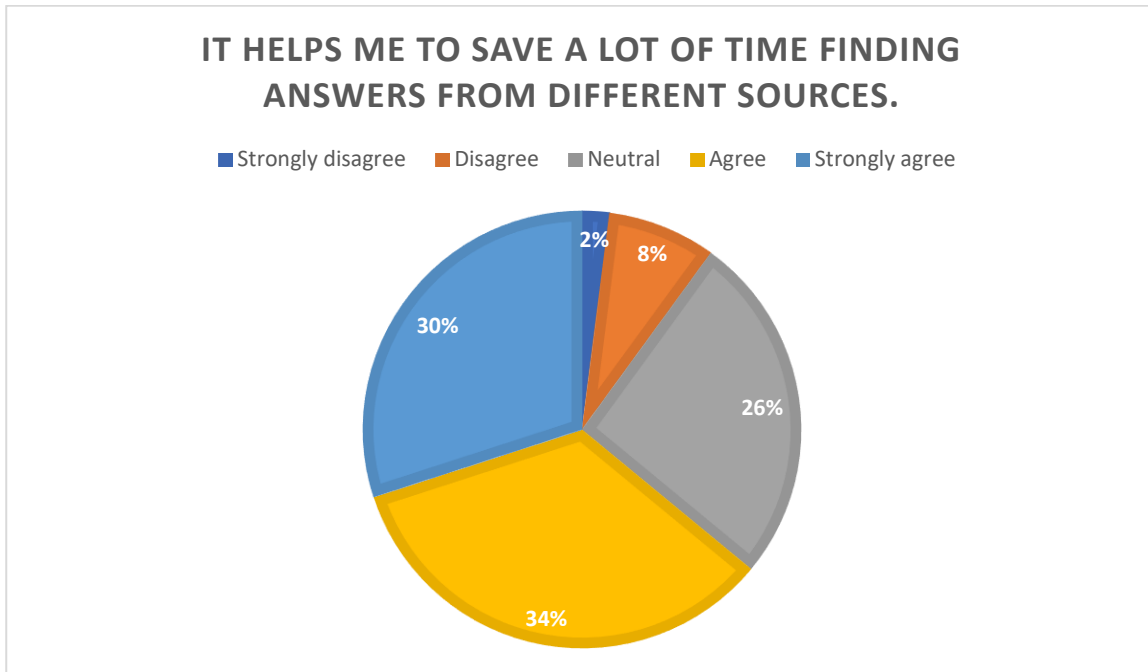


Figure 10: Time saving issue with ChatGPT

To support the data of the four statements in the second question, the author has added a third question with optional content, participants can contribute their optional opinions to explain the assessments that they gave for the second question.

There were total 10 voluntarily responses that author has received from 50 participants. By using qualitative analysis method, these responses were placed into four different categories.

It is only useful with the information which is available on the Internet or posted information, it means that chatGPT may not know a lot about sensitive information.

my work is not open source so ChatGpt cannot access to learn

Table 1: Participants questioning about ChatGPT's data access.

There are two participants saying that they are skeptical about ChatGPT's data scope, they think that they can not get all the necessary information from ChatGPT because their data is not open source.

sometimes the answer it provides is not reliable so I need to find another source

It just fine to .replace(chatGpt, conventionalSearchingMethod). Sometimes, chatGPT is dangerous tool because the information is bias or old-fashioned. Otherwise, it is outstanding searching tool at the moment.
The answers it provides are sometimes outdated or incorrect.
For general information ChatGPT is a great help but when it comes specific information, data, its reliability is still in question.
ChatGPT really likes to make faulty, but convincing answers. It's best to ask it to provide a list of facts in its answer, and then later fact-check that list

Table 2: Participants were skeptical about the reliability and accuracy of the data that ChatGPT provides.

A total of five participants said that they did not completely count on the answers that ChatGPT provided, some said that the information was outdated and inaccurate, one said that ChatGPT would be of great use if we are only looking for general information and it is less accurate if we use it to search for specific information. Another one said that even though the answer ChatGPT provides looks very convincing, it is in fact faulty sometimes.

I usually use it to brainstorm first then go verify its answer before adding anything to my assignment.
---

Table 3: Participant uses ChatGPT with caution

There was one participant who said that they always brainstorm ideas before looking for answers from ChatGPT as a confirmation method.

I'm too busy when working and studying at the same time so chatgpt helps me alot in assignments and suggesting ideas well.
Although the codes given by chatGPT looks great, many of them are just random generated codes that aren't functional at all and take me much time and effort to debug.

Table 4: Time issue while using ChatGPT

There were a total of two mixed opinions when asked about time issues when using ChatGPT. One person said that they saved a lot of time on assignments and provided support in terms of idea suggestions. The other one said that the codes that ChatGPT provided looked good at first glance, but when they looked at it carefully, it turned out to have a lot of small errors in the code, and in the end, it took them more time to debug those errors.

#### 4.4 Concern about using ChatGPT on learning performance and future careers

The fourth question in the survey directly answers the third question and sub-question posed in the first part of the research. Which is all the concerns and ethical problems relating to the use of ChatGPT on the student's learning performance and potential future careers.

The structure of the fourth question is the same as the second question, it includes five statements given by the author based on the ideas on the theoretical framework chapter. These five statements were also conducted based on matrix choice from a scale 1 to 5 with 1 being strongly disagreed, 3 being neutral and 5 being strongly agreed. The purpose of using this scale is to determine the perceived rating of the statements of each participant. It then helps to collect quantitative data and gain many insights.

The first statement was about overall assessment of using ChatGPT on the learner's ability, the purpose of this question is to evaluate whether ChatGPT has an impact on the student's ability or not, comparing to not using ChatGPT.

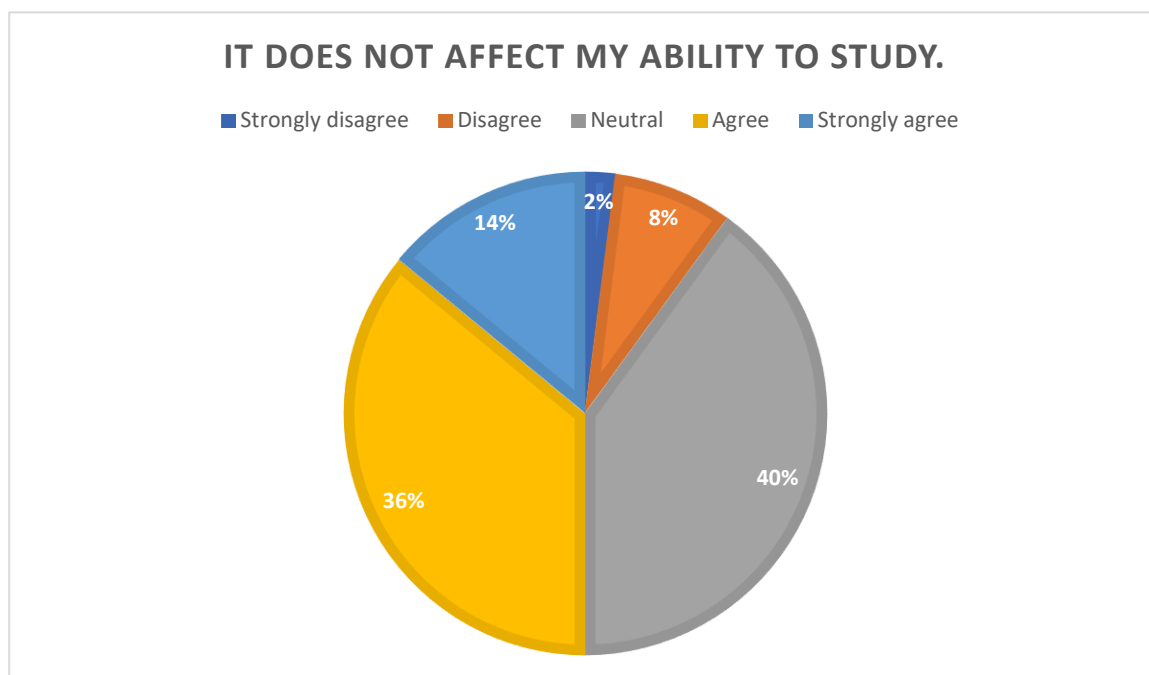


Figure 11: the influence of ChatGPT on the students's abilities.

The data received shows that the majority of users agree with the statement, 36% of users think that ChatGPT does not greatly affect their ability to study, 14% completely agree with the hypothesis and only 10% do not agree with this opinion. What is worth mentioning is that up to 40% of participants kept their opinions at a neutral level. This suggests that they are not sure whether ChatGPT affects their learning or not.

The second statement asked participants what they thought about the accuracy and reliability of ChatGPT's responses.

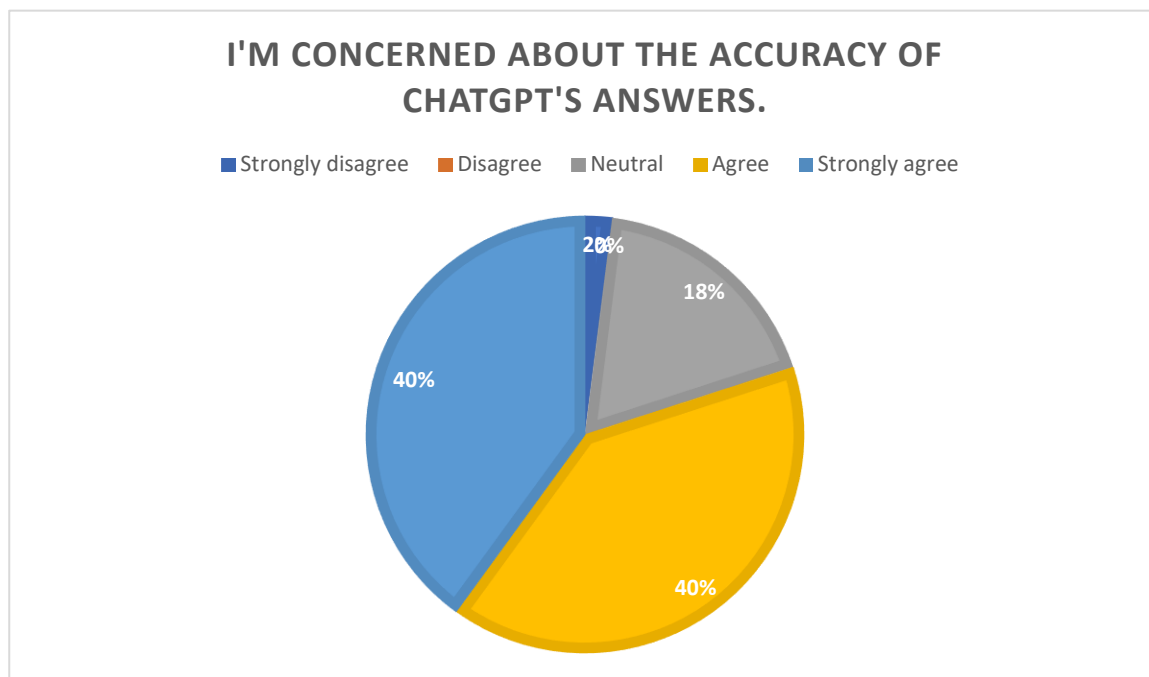


Figure 12: ChatGPT's accuracy and reliability concerns.

This statement was agreed upon by the majority of participants when up to 80% of participants agreed or strongly agreed with the statement. Leaving just 2 % of participants on the strong disagree side and 18% stays on the neutral.

The large amount of people supporting the statement suggests that the majority of users still have great concerns about the reliability and accuracy of ChatGPT.

The third statement in the third question asked participants if they were concerned that using ChatGPT as a support tool would make it harder for students to develop their other important skills such as critical thinking and independent problem solving.



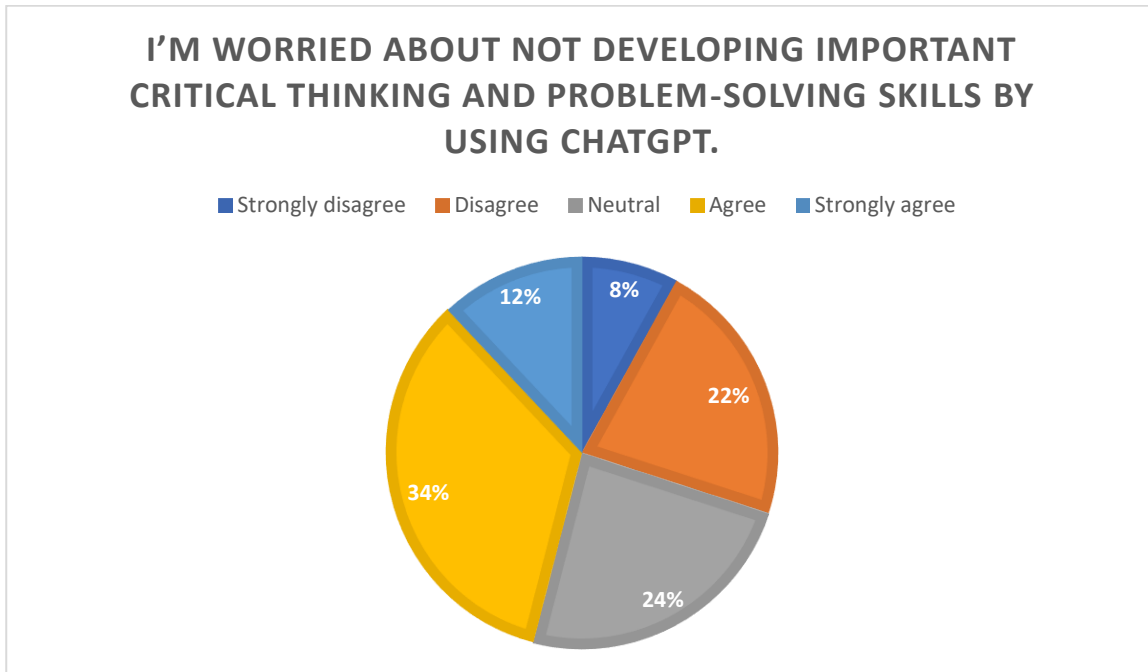


Figure 13: Asking participants if they are worried about not developing important skills.

Out of 50 participants, 24 % said that they were not sure whether or not it affects themselves as they chose to stay neutral, the remaining 34% agreed with the statement and 12% strongly agreed with it. The remaining 30% of people are on the disagreeing side. This suggests that although there are a lot of people using ChatGPT at the moment, a large number are still concerned that their soft skills may be affected.

The fourth statement talked about how participants use ChatGPT. The purpose of this statement is to see if survey participants feel like they are relying too much on ChatGPT. The data received from this statement will directly answer the sub-question of the main third question "Does it make students learn more effectively or more dependent on the technology?".

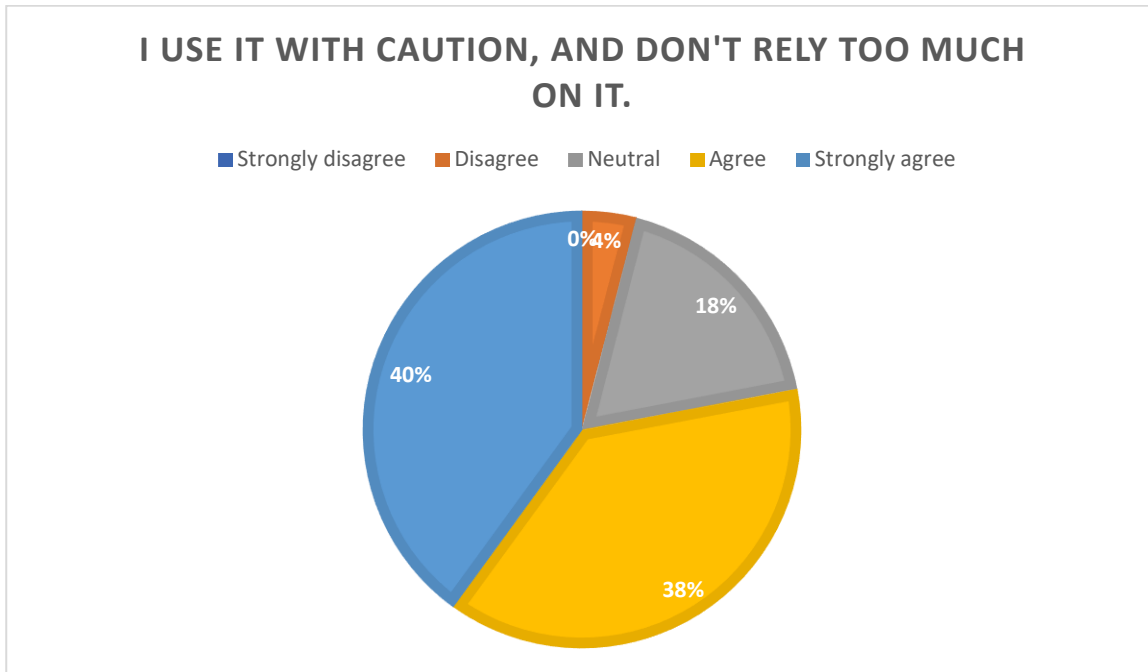


Figure 14: User dependence on ChatGPT

Only 2 users out of 50 participants disagreed with the statement. The remaining 78% of participants agreed with this statement, 18% did not lean towards either side.

The statistics suggest that survey participants were quite confident that they were not too dependent on ChatGPT.

The last statement in the question is “I’m not worried that ChatGPT will negatively affect my future, but instead will be of great help.” The purpose of the statement is to ask participants if they are concerned that using ChatGPT will have a negative effect on their future in any way. Or will it become a great tool to help one’s career.

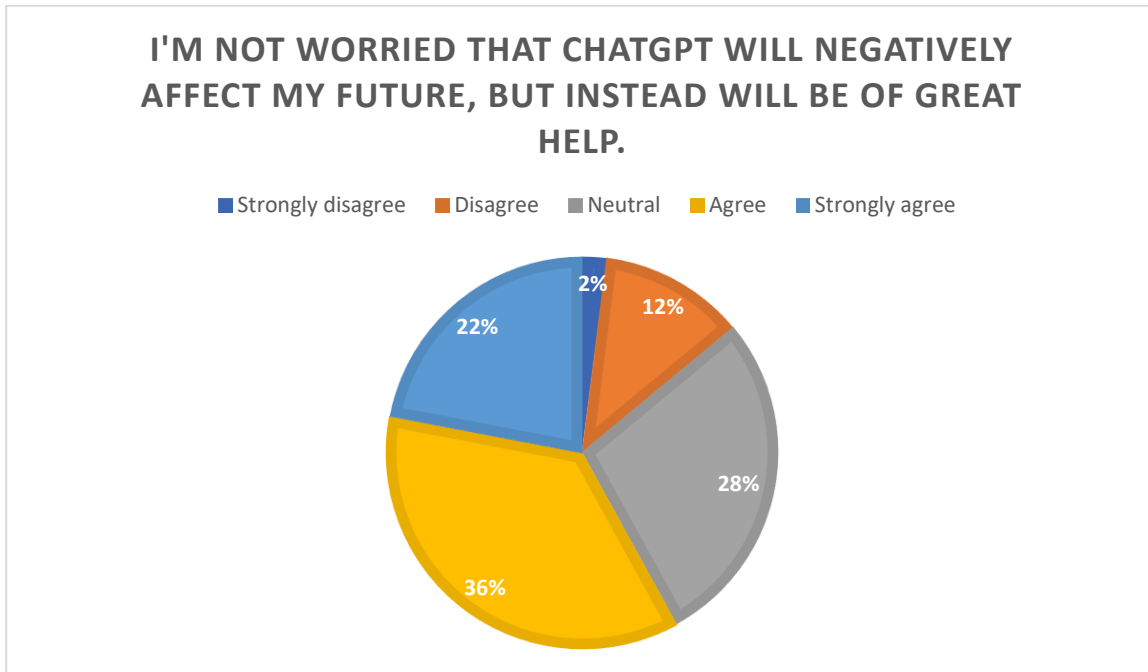


Figure 15: ChatGPT's impact on users' futures.

36% of survey participants agreed with the statement and 22% strongly agreed with it. 28% of participants left their opinion as neutral, which indicates that many people still do not completely trust ChatGPT or do not know whether they will be dependent on it or not. 12 % disagree with this opinion and 2 % strongly disagree. Suggesting that a small number of participants remained concerned about their future use of ChatGPT.

At the end of the survey, the author also left a final question as an optional comment section for participants. The question has the same meaning as third question, where if participants have any optional comments they can provide to explain their choice to evaluate the statements before.

Voluntarily comment to clarify your choice above :

3 responses

Can't say about the far future, but now it's still safe for us hahaha

Sometimes, information is out of date.

Abusing chatGPT for every daily matter can raise bad habits for our critical thinking. We can prioritize it as first choice, but we should not 100% trust or copy from it.

Figure 16: Optionals comment to clarify the assessment of the fourth statement.

The final optional question only received 3 responses out of 50 participants. One people said that the future is a very distant story, and currently they think that ChatGPT is still safe for most users. Another one shares the same opinion as many people in the second statement, saying that ChatGPT's information is out of date sometimes. The last one clearly expressed their concerns about using ChatGPT, which will lead to the creation of bad habits of misusing this technology and affecting students's critical thinking. They also said that people should not completely trust and copy answers from ChatGPT. This supports the argument that there are still many people who are concerned about using ChatGPT affecting students' personal development skills.

## 5 Discussion

### 5.1 Summary of the thesis

The research was conducted for approximately six weeks, the actual time taken to do the research was a little bit shorter which was planned for about two months but is fairly close to the expected timeframe given at the thesis plan.

The theoretical frameworks serve as a backbone for the entire research. It generated reasons why this research was worth implementing, it pointed out the current problems that ChatGPT is facing in education and lays the foundation for formulating questions and helped to conduct survey questions for the author.

Following the end of the thesis, the author has succeeded in achieving all the goals set out at the beginning of the research. All three questions and sub-questions have been answered with primary data collected from the survey and secondary data from the open internet to back it up.

For the first question raised by the author at the beginning of the research “What are the benefits of using ChatGPT to the learning process of technology students?”. To answer this question, the author conducted a multiple choice questions to ask participants to choose one or more benefits that they think ChatGPT is benefiting themselves. The question includes five premade statements that have been conducted with the ideas formed based on the theoretical frameworks, in addition, one optional section was added at the end of the question in case participants want to submit their own perceived of ChatGPT’s benefit which has not been mentioned. These five statements are considered by the author to be the most popular benefits in the technology industry today, the purpose of this question is to find out among the 50 participants, what percentage are benefiting from what aspects of using ChatGPT.

The second question raised by the author was about the comparison between using ChatGPT and not using it. The question was aimed at answering the difference between the one who uses ChatGPT and the one who does not use it to see the potential benefits and drawbacks. Most students think that the use of ChatGPT in studying can save them a lot of time in finding information because of its unique search speed. But not all the answers from ChatGPT can be trusted, sometimes it provides faulty answers so it takes people even more time to verify its validity. Most students also agreed with the statement that ChatGPT is a great tool that can contribute positively to one’s study progress. But when it comes to the reliability of the answers, there are still many people concerned about the reliability of ChatGPT’s answers, some said that the information that ChatGPT provided is outdated or unreliable.

The research's third question and sub-question were answered by the third question in the survey, which is the potential concerns about using ChatGPT on one's current knowledge and future career. The question includes five statements requiring participants to pick the level of agreement with the statement based on a scale of 1 to 5, with 1 being strongly disagree, 3 being neutral and 5 being strongly agree.

## 5.2 Conclusion

A large number of participants said that ChatGPT helps them explain difficult concepts in the technology industry, and help with school-related assignments like homework, essays, and exams. It also helps students to find information faster and more effectively. A small number of participants said that it also helped them in writing code and debugging it.

Most students think that the use of ChatGPT in studying can save them a lot of time in finding information because of its unique search speed. But not all the answers from ChatGPT can be trusted, sometimes it provides faulty answers so it takes people even more time to verify its validity. Most students also agreed with the statement that ChatGPT is a great tool that can contribute positively to one's study progress. But when it comes to the reliability of the answers, there are still many people concerned about the reliability of ChatGPT's answers, some said that the information that ChatGPT provided is outdated or unreliable.

A lot of students expressed their opinion that ChatGPT does not affect their ability to study, and a decent amount of people remain neutral with the statement saying ChatGPT does not affect their ability to study, suggesting that a lot of people who do not know whether they can study as well as they do now compared to not using the technology. Almost everybody who participated in the survey expressed that they are very concerned about the accuracy of ChatGPT's answers, meaning that ChatGPT still has a lot of things to do to improve the accuracy and validity of answers. The data also suggests that there are some concerns about not developing critical thinking and important skills by using ChatGPT.

In addition, a lot of students believe that people should use the tool with caution and should not fully rely on the technology, by using ChatGPT as a supporting tool and carefully checking its answers, it can become a very helpful tool for study and working.

To conclude, the research suggests that at the moment, ChatGPT is still a highly useful tool and its application in IT education is very practical and generous. With that being said, besides all the benefits it can offer for students, there are also a lot of drawbacks on the other hand that need to be addressed. Students should only use it with caution and should understand its working mechanism before implementing it in one's study plan. Using the tool with care and caution helps to maximize

the progress of one's study, and helps one to achieve the best possible learning outcome and avoid potential negative impact it might have on one's important skills and future career.

### **5.3 Reflection of the results with regards to the theoretical framework**

The results corresponded well to the theoretical framework. During the theoretical framework, the author spent time researching ChatGPT, the history of ChatGPT, and how it works. By understanding its working mechanism and how it produces answers, the author has a clear view of what benefits it may offer to students and what harms may it cause. One clear example to demonstrate the connection between the result and the theoretical framework is it is clear that a large number of participants are concerned about the reliability and safety of ChatGPT, this was researched in ChatGPT's working mechanism section, where it was shown that ChatGPT only absorbs all information online without verifying the reliability of the content.

### **5.4 The reliability and ethics of the thesis**

Reliability and ethics are most important characteristics in determining the validity of the research.

The research is considered highly reliable based on the theoretical framework that the author spent two weeks to conduct, the theoretical framework was conducted by reviewing different reliable online articles. All the references that were used were mostly for conducting the theoretical frameworks, the author looked for the most reliable sources possible and avoided unreliable and suspicious articles. Understanding the current situation of ChatGPT and its application in education, it helped to raise all the questions about its benefits and concerns for students using it.

The chosen target group is also highly reliable because it helped a lot of Vietnamese students to get enough data thanks to the enthusiasm of students in the group. The group has helped many students get helpful data for their thesis in the past. By approaching this group, reliable primary data are collected.

The response fraud was prevented by having friendly and simple quantitative questions, the statements were clearly written and objective. This means that respondents can participate in the survey without typing anything in words and they can provide data with just a few mouse clicks. The participation is also made clearly voluntary, meaning there is no obligation on the part of the author. The author respects each participant and the value they have offered to the project.

## **5.5 Further research proposal**

Some potential further research ideas can be the impact of ChatGPT on other study's majors. For example, business, economics, and government/political. The potential impact of ChatGPT in these industries is promising and worth researching.

With the constant development of ChatGPT and AI tools in general. There are more and more AI tools with ChatGPT-like features. Another proposal would be to study the impact of those AI tools on the learning process of students.

## **5.6 Author's self-reflection on the thesis and own learning**

The thesis started at the end of September after many consulting appointments with the author's first thesis advisor. The total time spent on conducting the thesis was approximately 6 weeks. After getting topic approval from the author's supervisor, the author spent all the possible free time on the thesis while working full-time in another industry.

The thesis was the last course that the author needed to take in order to graduate on time with their own schedule. By conducting the research, the author has developed many important skills such as critical thinking, time management, and reading ability. The author realized that the thesis is a very important part of any student's life and took it seriously from the beginning. The thesis ideas came up from the phenomenon of ChatGPT and everyone around the author's circle mentioning about it. Leading to the inspiration to conduct research on it.

The most challenging part of writing the thesis was reading and reviewing materials, the author had to read a lot of materials from different sources to conduct a reliable theoretical framework. The author also had to filter all the unreliable sources to eliminate bias and faulty information. On the other hand, it was a very good experience because it helped to improve the author's reading ability, reading enthusiasm, and critical thinking. The author was highly interested in ChatGPT and AI in general, which is why the author wrote the thesis with passion and curiosity.

The thesis was a very memorable piece in the author's college study and the author really appreciates all the time spent on it. The author would like to thank Haaga Helia University of Applied Sciences for always being a supportive organization. The author would like to thank the thesis advisor for always helping and answering all the questions relating to the thesis process. The author would like to thank all the voluntary participants for participating in the thesis survey to help produce data for the research.



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## Appendices

### Appendix 1: Survey's questions

#### Impact of ChatGPT on the learning process of technology students amongst higher education

Dear respondents,

By doing this survey, not only does it contribute to the completion of the author's thesis, but it also helps with research on using ChatGPT for students who are planning to use ChatGPT in their study process.

Thank you very much for your time!

\* Indicates required question

**Please choose the benefits that ChatGPT has brought to your learning process** \*  
(Select one or more):

- ☐ It helps me understand complex concepts in the technology field.
- ☐ It helps me to write code in difficult situations.
- ☐ It helps me to debug my code and explain it clearly.
- ☐ It helps me with school's assignments, essays and exams.
- ☐ It helps me find information faster and more effectively.
- ☐ Other: \_\_\_\_\_

**Please rate the perceived benefits of using ChatGPT compared to traditional learning method (By using Google, books, online articles)?**

**On a scale 1-5 (1: Strongly Disagree, 3: Neutral, 5: Strongly Agree)**

\*

1

2

3

4

5

It is an amazing tool that contributes to my study progress.

☐☐☐☐☐

It produces faster answers than traditional searching methods like (Google, Microsoft Bing).

☐☐☐☐☐

The answers it produces is more reliable than other sources.

☐☐☐☐☐

It helps me to save a lot of time finding answers from different sources.

☐☐☐☐☐

**Voluntarily comment to clarify your choice above :**

Your answer

**What are your concerns in using ChatGPT to your current knowledge and future career?**

**On a scale 1-5 (1: Strongly Disagree, 3: Neutral, 5: Strongly Agree)**

★

	1	2	3	4	5
It does not affect my ability to study.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm concerned about the accuracy of ChatGPT's answers.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm worried about not developing important critical thinking and problem-solving skills by using ChatGPT.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I use it with caution, and don't rely too much on it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm not worried that ChatGPT will negatively affect my future, but instead will be of great help.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Voluntarily comment to clarify your choice above :**

Your answer