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## A quantitative study on the negative and positive impacts of using artificial intelligence (AI) in the information technology field

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### Abstract

The purpose of this study was to understand how Generative Artificial Intelligence (AI) tools could potentially cause negative and positive impacts in the Information Technology sector. Although previous studies about valuable perspectives on the diverse effects of AI on the IT domain, few have given attention to examining how generative AI tools could bring about both adverse and beneficial effects within the IT sector. To fill this research gap, this study used a quantitative study to measure how Generative AI tools could potentially cause negative and positive impacts in the Information Technology sector. Data was collected through a survey deployed on LinkedIn between March 1st, 2024, and April 1st, 2024. The target population for the survey was college instructors and working professionals in the field of IT. A total of 52 participants completed the survey. The findings of the study have indicated that there is a significant positive and negative relationship in the perception of using AI tools among IT professionals and educators. This study contributes to theory aiming to examine the negative and positive impact of using AI tools.

**Keywords:** artificial intelligence (AI), impact assessment, AI adoption and innovation, data security and privacy, automation risks, technological advancements

### Introduction

Artificial Intelligence (AI) holds enormous potential for public advancements, but it also exhibits certain risks that could establish a threat to humankind. AI has both positive and negative impacts on humanity and society. On the positive side, AI can for example increase efficiency and support in healthcare in both clinical and patient use, assist with legal services and demands, and increase access to research & development and education (Lifewire, 2023). One worry is the likelihood of AI systems becoming so advanced that they exceed human intelligence, heading to a consequence known as “singularity” (Hunt, 2023). In such a condition, these advanced AI systems could make choices or take actions that humans cannot recognize or limit, possibly leading to unexpected and hypothetically harmful consequences (Hunt, 2023).

For instance, AI is being used to solve complex problems such as enhancing data analysis and improving customer service (Brilliantio, 2023), and it's also assisting to create ease of access for differently abled

individuals (Lifewire, 2023). Additionally, AI-powered technologies like digital personal assistants and smart home technologies are making our daily lives simpler and more convenient (Salokannel, 2023).

Nonetheless, on the negative side, AI can lead to employment displacement due to automation (Thomas, 2021), (Duggal, 2023). There are also ethical worries about bias and privacy, as well as security dangers from hacking (Thomas, 2021). The deprivation of clarity and explainability in AI and deep learning models can lead to unfair or dangerous decisions (Duggal, 2023).

Likewise, the speedy advancement of AI, leading to the ability of AI topping human intelligence, establishes a significant threat (Hunt, 2023). Hence, it's crucial to balance the advantages and threats of AI and implement healthy ethical standards and controls for its advancement and use (Duggal, 2023). In addition, there are apprehensions about the exploitation of AI in areas such as autonomous weapons or surveillance systems, which could violate privacy rights or be used maliciously (Vallance, 2023). Thus, it's crucial to execute robust ethical standards and controls for the development and use of AI to stop these risks (Vallance, 2023).

## Literature Review

Across the course of history, innovation has consistently been the catalyst for elevating the quality of life. Innovation is not without its challenges, often leading to notable worldwide disruptions. Previous examples of notable worldwide disruptions in the past three decades were related to technological advancements were innovations such as the Internet of Things (IoT), big data, data science, cloud computing, and now the adoption of AI. All these items have been in existence for a minimum of 25 years but only recently has AI started to gain widespread acceptance. AI has the potential to generate strong profits, efficiencies and be economically feasible for businesses or individuals to implement (Chui et al., 2023). In the following sections, the positive and negative impacts of using AI will be discussed.

### Positive Impacts of AI

A possible positive impact of using AI could be the ability to address challenges across various domains such as climate science, drug discovery, and engineering. By using AI, simulations can be created by scientists and researchers to investigate many different scenarios and enhance solutions without the need for expensive and time-consuming physical experiments. Learning how to use generative AI enables society to enhance creativity by rapidly producing text, art, or music. AI offers the potential to automate routine and time-consuming tasks, leading to significant productivity enhancements by streamlining repetitive processes.

Grundner and Neuhofer (2021) researched existing gaps of literature by actively contributing to the advancement of AI in tourism destinations. The goal of their study was to comprehensively explore both the positive and negative aspects of AI within the tourist destination experience, fostering a deeper understanding of its implications. Their results indicated that the primary effects of AI on the future tourist experience are evident in three specific themes: information, personalization, and comprehensive technological integration.

Citak et al. (2021) explores respondents' perceptions and attitudes towards AI, particularly its integration within hotel environments. Their goal is to address how potential customers can incentivize the hotel industry to adopt specific AI solutions. Citak et al. (2021) results suggested that the most important AI positive impact within hotel services include self-service check-in and check-out services. This impacted how guests were assisted upon their arrival or departure from the hotel.

## Negative Impacts of AI

A possible negative impact of using AI could be related to Generative AI, particularly in Large Language Models (LLMs), where it has the capacity to produce a vast array of content across various contexts. The quality of the content generated by these tools is contingent upon the quality of the data they are trained on, and the technology could harbor significant flaws. An example of a flaw using these tools is the potential to present inaccurate statements as factual occurrences, this is commonly referred to as 'AI hallucination'. Another example of a flaw using these tools is that it may exhibit biases and susceptibility to leading questions, making it easily influenced. These tools can be manipulated into generating harmful content and lead to corruption.

Arnaout and Razniewski (2023) investigated the capability of LLMs to produce noteworthy negative statements regarding real-world entities. They assessed the accuracy and relevance of the generated lists from the LLMs concerning subjects from various domains. Their evaluation indicated that the guided probes they used in their investigation indeed enhanced the quality of generated negatives. They concluded that despite recent advancements, LLMs continue to encounter challenges regarding the factual accuracy of negative statements. LLMs often produce numerous ambiguous or positively interpreted statements despite the presence of negative keywords.

Another example of an AI negative impact could be job displacement. A branch of AI called machine learning (ML) uses algorithms to complete tasks by understanding statistical patterns in data, as opposed to strictly adhering to human instructions. This technology has recently demonstrated extraordinary proficiency across a diverse range of economically significant tasks. ML can lead to replacing humans in several diverse economic jobs that are linked to high-paying occupations. Several examples of this diverse job field are radiologists, media jobs, tech jobs, market research analysts, finance jobs, traders (stock market), graphic designers, accountants, customer service agents, and agricultural workers.

Webb (2019) investigated how to predict the impacts of any technology on occupations. Webb created a new method for identifying which tasks can be automated by any specific technology. Webb found that AI impact will be the highest for high-skilled occupations, suggesting that AI will affect very different people than software and robots.

Valle-Cruz et al. (2023), proposed a model for investigating the negative impacts of artificial intelligence (AI) within governmental contexts. They organized 14 facets of its detrimental aspects into five socio-technical categories. Their research outlines key areas within the topics of Artificial Intelligence and Intelligent Algorithms that warrant attention. Their results indicated that five negative impacts of AI within governmental contexts are data and technological (bias, errors, fake news), organizational and managerial (workforce and human replacement, dependance), political, legal, and institutional (ethics, morals and law, human rights, privacy, injustice, weaponization, national and information security), environmental (market failures), and explainability (opacity, complexity).

## Research Methodology

The main research question that this study addressed was:

**RQ:** *Is it important to understand how Generative AI tools could potentially cause negative and positive impacts in the Information Technology sector?*

The following hypotheses were tested:

**H<sub>1</sub>.** *Does a comprehensive understanding of Generative AI tools contribute to predicting potential positive impacts in the Information Technology sector?*

**H<sub>2</sub>.** *To what extent can informed decision-making regarding Generative AI tools contribute to minimizing potential risks and challenges in Information Technology?*

**H<sub>3</sub>.** *To what extent can informed decision-making regarding Generative AI tools contribute to positive impacts in Information Technology?*

## Questionnaire Development and Testing

The questionnaire contained ten questions and were developed based on prior literature. A demographic question was asked to gather the age range of the participants. A pretest was conducted on a group of participants who completed the questionnaire by themselves, without intervention or support from the researcher. The pretest was given to participants from a specific targeted audience. The purpose of the pretest was to validate the questions on the questionnaire. The questionnaire was converted into a survey and created through a website (<https://www.google.com/forms/about/>). The researchers decided to use Google Forms because of its reputation for stability and for the simple appearance of the interface that it provided. Google Forms uses traditional web widgets such as checkboxes and radio buttons. This interface helped reduce the number of instructions on how to reply to the questions. Google Forms was chosen by the researchers due to the built-in functions to analyze the results of the data collection. These tools have been tested and validated by previous studies. The tools that were provided by Google Forms were at no cost to the participants or researchers.

## Data Collection Methodology

The usage of understanding how Generative AI tools could potentially cause negative and positive impacts in the Information Technology sector was measured with previously validated instruments. The instruments used in the study were a series of survey questions that were measured on a 5-point Likert-type scale in which 1 denoted “Strongly Agree (SA),” 2 denoted “Agree (A),” 3 denoted “Neither Agree nor Disagree (NAND),” 4 denoted “Disagree (D),” and 5 denoted “Strongly Disagree (SD).”

The participants for the survey were sent a link through email or got access to the questionnaire through a LinkedIn post. The participants were able to access the survey between March 1st, 2024, to April 1st, 2024. Participants were given an introduction and the purpose of the survey before being asked to take it. Participants were expected to fully understand the purpose of the survey and agree to the terms and conditions before proceeding to complete the survey.

The targeted participants were individuals who had previously worked or taught in the information technology field. The purpose of the survey was to collect data and analyze the results to add to the body of literature regarding the importance of how Generative AI tools could potentially cause negative and positive impacts in the Information Technology sector. Surveys and questionnaires are widely used in research to target a specific population with questions designed to measure and collect data about a specific topic (Alvarado et al., 2016). This technique provides precise calculations of the variables that are being used in the study. Table 1 list the statements in the questionnaire were given to the participants of this study.

**Table1 Question Statements used in study.**

Question #	Question Statement
Q1	Please select your age range.
Q2	Please select your gender.
Q3	I believe that I understand Generative AI tools and their potential impacts in the Information Technology sector.
Q4	I believe <u>that everyone</u> that works in the Information Technology field should experience how Generative AI tools can cause both positive and negative effects.
Q5	I believe <u>that I have</u> enough knowledge regarding the potential negative consequences that may arise from the use of Generative AI tools in Information Technology
Q6	I believe <u>that I do not have</u> enough knowledge regarding the potential negative consequences that may arise from the use of Generative AI tools in Information Technology.
Q7	I believe that Generative AI tools <u>could</u> contribute to innovation within the Information Technology field.
Q8	I believe that Generative AI tools <u>will not</u> contribute to innovation within the Information Technology field.
Q9	I believe that every company should be implementing ethical guidelines and regulations concerning the use of Generative AI tool.
Q10	I believe that companies <u>should not</u> be implementing ethical guidelines and regulations concerning the use of Generative AI tools.

## Questionnaire Distribution

In this study, data collection was conducted using LinkedIn, an online professional social network site. A link was posted on LinkedIn to invite participants to the survey. This was the only contact with the participants, and the post explained the purpose of the research, who the researchers were, and the approximate time it would take to complete the questionnaire. Google Forms provided a header for the survey questionnaire to include additional information for the participants. This helped to show the participants the specific topic for the study.

## Data Analysis

To ensure the quality of our data collection, a thorough review of the collected questionnaires, removing incomplete responses and inconsistent answers. After this screening process, the partial least-squares structural equation modeling (SmartPLS4) was used to analyze a total of 52 responses from the questionnaire. This method is recommended for testing complex and less established theories, and this method was used to create a theoretical framework to visualize our variables and hypotheses. The results, including the descriptive statistical analysis of the sample data, are presented in the following section.

## Results

### Demographics

The questionnaire was taken by 52 participants. The data was collected from March 1<sup>st</sup>, 2024, to April 1<sup>st</sup>, 2024. The participants were all over the age of 18 years and were college instructors or working professionals in the field of Information Technology. Of the 52 participants, 38 were male and 14 females. Question 1 asked the participants to select their age range. The possible age range choices were 18-24, 25-34, 35-44, 45-54, 55-64, and over 65. Of the participants, 0% (0 participants) were under 18, 11.5% (6 participants) were in the 18-24 range, 15.4% (8 participants) were in the 25-34 range, 26.9% (14 participants) were in the 35-44 range, 25% (13 participants) were in the 45-54 range, 15.4% (8 participants)

were between the ages of 55 and 64, and 5.8% (3 participants) were over the age of 65. The demographic factors of the participants who completed this survey can be found in Figure 1.

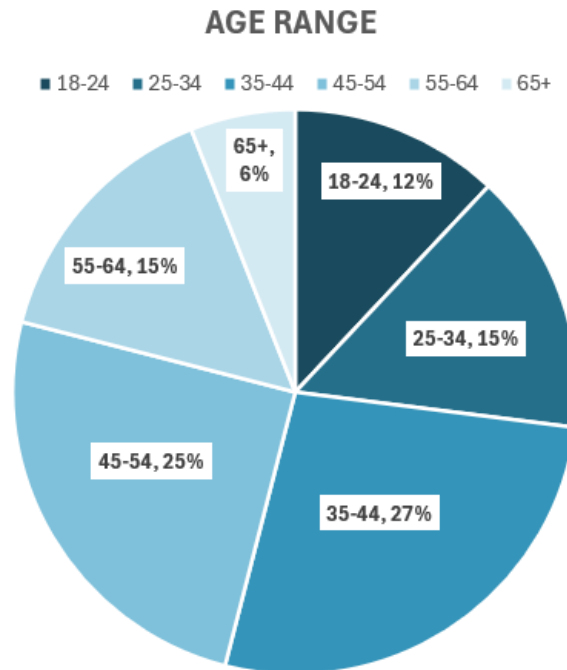


Figure 1: Demographics of the participants

### Results

In this study, SmartPLS4 was used to measure the proposed constructs and to test the hypotheses. In research questions RQ4-RQ6 and RQ9, the analysis of the survey data indicated that 48% of the participants selected “Strongly Agree” and 42% “Agree” regarding their perception of how Generative AI tools may have both positive and negative impacts on the information technology domain. An interesting observation is that 62% of the participants selected “Strongly Agree” and 22% selected “Agree” to the perception that every company should be implementing ethical guidelines and regulations concerning the use of Generative AI tools. The results of participants’ responses are summarized in Table 2.

Table 2: Survey Results

Q#	SA	A	NAND	D	SD
Q3	23	19	4	6	0
Q4	25	22	4	1	0
Q5	13	17	9	12	1
Q6	4	19	7	11	11
Q7	23	20	4	4	1
Q8	5	7	7	16	17
Q9	32	11	5	4	0
Q10	1	8	6	13	24

Data Synthesis for Research Question

Using SmartPLS4 statistical analysis software, various factors were identified that impacted the positive or negative perception of using Generative AI tools in the information technology (IT) field. The results shown in Figure 2 indicated that the value of RQ4-RQ6 and RQ9 are below the Cronbach’s alpha of .70, thus indicating that the participants’ perception of using Generative AI tools may not impact the technology sector. The results for research questions 3, 7, 8, and 10 were above .70 indicating a positive significant relationship among constructs. To measure the latent construct variables, the findings are organized and displayed using the framework presented in Figure 2.

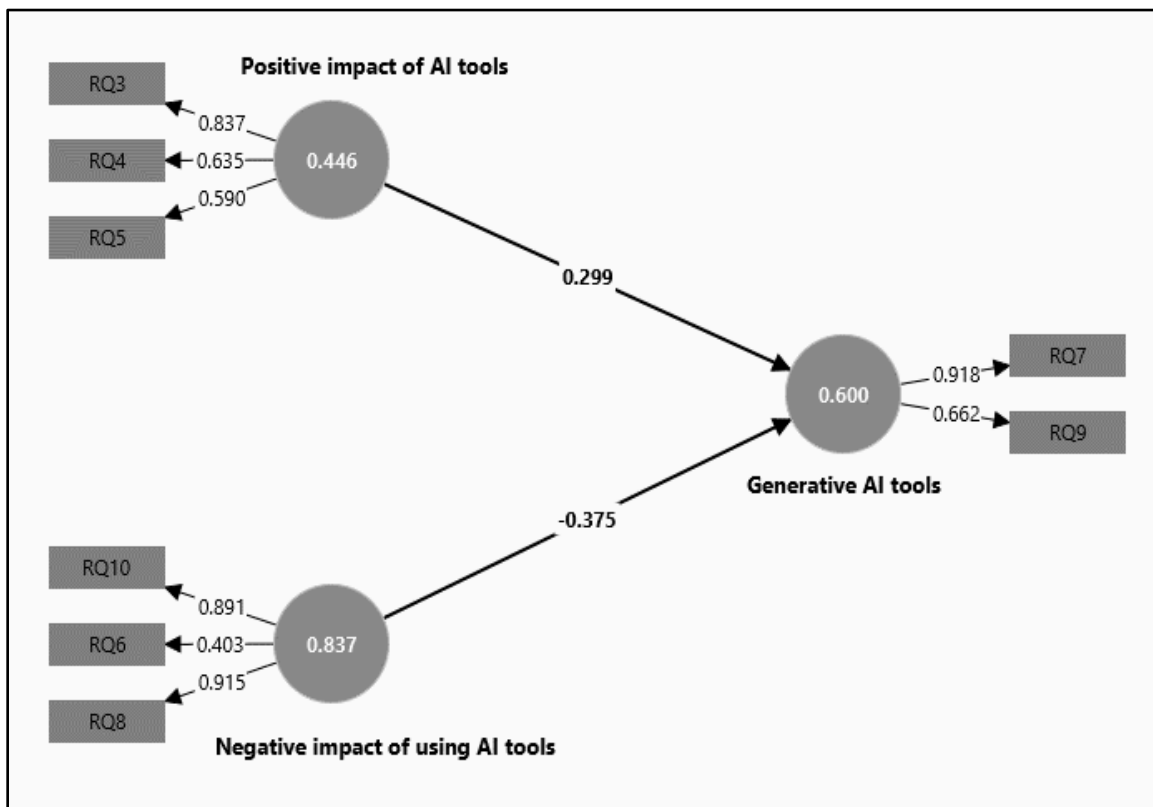


Figure 2: SmartPLS4 Path Model

Latent variable types and their respective factor loadings are shown in Figure 3. The factor loadings show the strength of various constructs indicators. The factor loadings must be more than 0.7 to be considered as significant. The values in Figure 3 indicated that there is no positive or negative impact on the perception of Generative AI tools between RQ4-RQ6. However, the path coefficients showed a significant positive relationship between positive perception of using AI tools and the use of Generative AI tools. The results supported H1 regarding the understanding of the positive impact of AI tools in the IT fields. However, hypotheses 2 and 3 are not supported.

Question #	Outer loadings
Q3 <- Positive impact of AI tools	0.837
Q4 <- Positive impact of AI tools	0.635
Q5 <- Positive impact of AI tools	0.590
Q6 <- Negative impact of using AI tools	0.403
Q7 <- Generative AI tools	0.918
Q8 <- Negative impact of using AI tools	0.915
Q9 <- Generative AI tools	0.662
Q10 <- Negative impact of using AI tools	0.891

Figure 3: SmartPLS4 Outer loadings

**Summary**

The findings of the study demonstrate the need for an open discussion regarding the positive and negative perception of the use of Generative AI tools among information technology professionals and educators. One suggestion would be to motivate the users of AI tools, IT professionals must first educate the user with accurate information about the tool, its positive and negative attributes. The results indicated that there is a strong correlation to the positive perception of using Generative AI tools to innovative contributions in the information technology sector.

Construct reliability and validity - Overview				
	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Generative AI tools	0.475	0.600	0.777	0.641
Negative impact of using AI tools	0.676	0.837	0.802	0.598
Positive impact of AI tools	0.0450	0.446	0.733	0.484

Figure 4: SmartPLS4 Path Coefficients List

The path coefficients shown in Figure 4 from this study indicated a relationship between the participants' perception of using Generative AI tools in the Information Technology field. It is important to observe from the survey results that almost 70% of the participants responded to the negative and positive impact towards having AI ethical guidelines. This observation could warrant further investigation using similar survey-based study settings.

**Reliability**

Cronbach's alpha, composite reliability and average variance extracted (AVE) are adopted to establish the model's reliability and validity. To evaluate the reliability of the measurements, this study used the PLS calculations to ensure the quality of the theoretical framework by removing measurement errors such as poorly formulated questions. Also, reliability was established by using three different subject matter experts (SMEs) to generate the survey questions. A SME is an individual who is a specialist in their field, with degrees and years of experience in a particular topic (Mattoon, 2005). The SMEs made the determination



of which questions should be on the questionnaire based on their knowledge and experience. The candidates to be SMEs in this research were recruited through a list of individuals in the information technology field. The candidates were determined based on their experience working within their chosen field, collaboration techniques, and soft skills.

## Discussion

The positive or negative impact on the use of AI tools in the information technology sector are supported by H1. It is important to note that H2 and H3 were not supported, this could be explained by the participants' perception of the use of AI tools. The results of this investigation provide valuable insight into the processes through which current trends in the perception of AI tools such as Generative AI are creating both negative and positive perception in information technology fields. Moreover, it demonstrates that users of Generative AI tools may become even more apprehensive if accurate information about the positive and negative effects of AI tools are shared.

## Limitations

The implementation of this study was not without certain limitations. The study is limited by the fact that it only focused on the measurement of specific variables. A limitation exists regarding the personal views of the participants using generative AI tools and how they could potentially cause negative and positive impacts in the Information Technology sector. It is unknown whether certain answers to the questions were biased, based upon the participant's previous experience using specific generative AI tools, therefore altering the acceptance of one or more hypotheses. Another limitation is the lack of knowledge regarding the participants' experience in using these generative AI tools and the size of the data sample. Further investigation is needed to establish if the same results could be duplicated through a larger data sample and applied across a broader context.

A future study could include the expansion of the sample size, which would be warranted to eliminate as much bias in the responses as possible. The need to balance the study by age group may also be warranted to remove any significant influence on the survey. Lastly, a second survey could be conducted on the same participants after they have learned more information related to generative AI tools, asking the same questions to determine if their opinions had changed since the participants' previous responses.

## Conclusion

In conclusion, the arrival of Artificial Intelligence (AI) within the Information Technology realm has brought about both advantageous and concerning outcomes. The beneficial aspects that AI has on the IT fields is that it has transformed the industry by automating tedious tasks, broadening decision-making approaches, and paving the way for innovation. AI's potential to enhance productivity, precision, and throughput promises to drive growth and add value.

On the contrary, AI presents significant challenges such as job displacement due to automation, privacy issues, and the potential for AI systems to make decisions beyond human comprehension or agreement. Moreover, the ethical dimensions of AI remain largely uncharted territory, demanding careful inspection of how AI will be used and implemented in the IT fields. Therefore, while AI offers immense potential for the future of IT, it's crucial to navigate its implementation with caution and ethical considerations to mitigate

potential adverse impacts. The trajectory of AI suggests its integration into every part of our lives, with advancements anticipated in areas like personalized healthcare, autonomous transportation, smart homes, and increasingly sophisticated natural language processing which will enable more human-like interactions with technology. A prediction of future regarding AI could be that everyone including researchers and educators will be affected in the next 5-10 years from now by developments created by AI tools.

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