# ChatGPT impacts on access-efficiency, employment, education and ethics: The socio-economics of an AI language model

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## Abstract

Generative artificial intelligence (AI) models, such as ChatGPT, have gained significant attention in various fields, including healthcare, education, and industry. This article aims to provide an overview of the impacts of ChatGPT on access, efficiency, jobs, and education, using technological determinism theory and social construction of technology theory as frameworks. The study highlights the potential benefits of ChatGPT in healthcare, education, and business, emphasizing the need for ethical considerations and human oversight. It acknowledges the limitations of ChatGPT in understanding context and tone and stresses the importance of ethical guidelines and best practices. The impact on the labor market and industries depends on how ChatGPT is socially constructed and used, with possibilities of job displacement and creation of new opportunities. In education, ChatGPT can enhance personalized learning, student engagement, and critical thinking skills, but accuracy, reliability, and ethical implications must be addressed. Policy recommendations include implementing ethical guidelines, maintaining human involvement, investing in training and reskilling programs, balancing human judgement and machine learning in education, considering the impact on the labor market, and addressing social and cultural implications. Collaboration with experts in AI, ethics, education, labor market analysis, and social and cultural studies is essential in developing comprehensive guidelines and policies for responsible use of ChatGPT.

Keywords: ChatGPT, access, efficiency, employment, education, ethics

## 1 Introduction

The development of generative artificial intelligence (AI) models, such as ChatGPT, has garnered considerable attention across various fields, particularly healthcare, education, and industry. ChatGPT is a natural language processing model that uses machine learning algorithms to generate human-like responses to user input. Its advanced language-modeling capabilities have been shown to enhance access to information, increase productivity, and streamline communication in various fields (Hopkins et al., 2023; Mattas, 2023). However, the increased use of ChatGPT and similar models has raised ethical and economic concerns regarding job displacement, privacy, and accountability (Zarifhonarvar, 2023).

In the healthcare sector, ChatGPT has the potential to revolutionize patient care and access to information. According to Hopkins et al. (2023), ChatGPT can serve as an intelligent chatbot to provide patients with accurate and reliable information regarding their conditions, treatment options, and clinical trials. Some authors suggest that ChatGPT can improve patient satisfaction and reduce the burden on healthcare providers by automation of routine tasks. In the education sector, ChatGPT has been shown to enhance the learning experience by provision of personalized and adaptive feedback to students (Baidoo-Anu & Owusu Ansah, 2023). ChatGPT can also support teachers by provision of automated grading and feedback on student work, freeing up more time for instructional planning and creative activities. In industry, ChatGPT and similar models are expected to affect employment by automation of routine tasks, which can lead to job displacement (Felten et al., 2023). However, the impact of ChatGPT on employment remains uncertain, and some researchers suggest that it can create new job opportunities in areas such as AI development, data analytics, and ethics (Zarifhonarvar, 2023).

Relying on technological determinism theory and social construction of technology theory, this literature review paper aims to therefore provide an overview of impacts of ChatGPT on access, efficiency, jobs and education, as well as identify gaps in existing research and future directions for research in this area. By following rigorous methodology, the literature review provides a comprehensive overview of current state of research on impacts of ChatGPT.

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The justification for this literature review is based on the growing interest in the use of chatbots powered by AI technology like ChatGPT in various industries and sectors. Potential benefits of ChatGPT have been documented in healthcare (Hopkins et al., 2023; Sallam, 2023), higher education (Firaina & Sulisworo, 2023; Baidoo-Anu & Owusu Ansah, 2023), ophthalmology (Antaki et al., 2023), libraries and academia (Lund & Wang, 2023), and labor market (Zarifhonarvar, 2023). Thus, this literature review aims to provide a comprehensive and up-to-date understanding of the potential impacts of ChatGPT on various sectors and industries.

Furthermore, the significance of this study lies in its comprehensive overview of the current state of research on the use of ChatGPT in various fields. The review explores the potential benefits and drawbacks of ChatGPT in different contexts, including healthcare education and research (Sallam, 2023), higher education (Firaina & Sulisworo, 2023; Baidoo-Anu & Owusu Ansah, 2023), and libraries (Lund & Wang, 2023), among others. It also examines economic impact of ChatGPT on different industries and occupations. The review, therefore, provides valuable insights into the potential of ChatGPT to revolutionize access and efficiency in different fields (e.g., education), as well as identify knowledge gaps and future research directions.

### **2** Theoretical Framework

Technological determinism theory argues that technology drives societal change, and individuals have limited control over the direction of this change. According to Marshal McLuhan, a prominent technological determinist, the impact of technology is "all-encompassing and thorough in the way it shapes and structures society" (Azam et al., 2020, p. 134). This perspective suggests that the development and implementation of technology have a significant impact on society and its institutions, including education, work, and communication (Evans, 2022; Evans & Mesagan, 2022; Evans & Oni, 2022; Guevara, 2022; Adeola & Evans, 2022; Adeola et al., 2023; Evans, 2023). For example, Guevara's (2022) study of television journalists during COVID-19 pandemic illustrates how the sudden shift to remote work and use of digital tools for reporting was a result of technological determinism. Journalists had to adapt to new technologies and ways of working to continue the production of content, which underscores how technology influences professional practices.

In the context of ChatGPT, technological determinism theory may be applied to argue that the introduction of an AI language model will have a profound impact on access, efficiency, jobs, and education, regardless of individuals' agency. This theory suggests that technology has potential to revolutionize various fields, such as healthcare, education, public health, tourism, and business. However, this also suggests that there are potential negative consequences, such as impact on employment and data privacy. This theory suggests that the development and implementation of ChatGPT should be guided by a thorough analysis of its potential impacts, both positive and negative.

Technological determinism theory has, however, been criticized for oversimplifying complex relationship between technology and society. Diniasti and Haqqu's (2022) analysis of documentary film "The Social Dilemma" demonstrates that reception of technological determinism among teenagers is not straightforward. While some participants believed that technology has a deterministic effect on society, others highlighted the role of human agency in technology and its impact.

Therefore, social context and individuals' interpretations of technology play a significant role in its impact on society. This perspective is consistent with social construction of technology theory, a sociological approach that emphasizes how technological innovation is shaped by social processes and not just by technological determinism. According to Kwok and Koh (2021), social construction of technology theory emphasizes the study of social context in which technological innovation takes place, particularly social values, norms, and power dynamics. This approach acknowledges that design, development, and use of technology are not neutral, but rather, are shaped by social actors who hold different interests, values, and perspectives.

For example, Varney and May (2021) explored social construction of cross-reality technologies in learning, applying social construction of technology theory. They found that adoption and use of cross-reality technologies in learning are shaped by social factors such as educational policies, instructional practices, and user perceptions. They argued that social construction of technology theory can help identify ways in which social context shapes design, development, and use of new educational technologies, and can provide insights into how to design technologies that better align with the needs and goals of different stakeholders.

In the context of ChatGPT, this theory suggests that technology's impact on society is not solely determined by its intrinsic properties, but is also influenced by societal and cultural factors (e.g., norms and values of organizations and individuals who use it). This theory suggests that the implementation of ChatGPT should be accompanied by a thorough analysis of social and cultural context in which it will be used; also the development and implementation of technology should be guided by needs and values of users. Overall, technological determinism provides a useful framework for analyzing the impact of ChatGPT on society, but it should be considered in conjunction with other theoretical perspectives, such as social construction of technology theory to fully understand the complex relationship between technology and society.

## 3 Methodology

The study employs a literature review approach to synthesize relevant literature on the impacts of ChatGPT on access, efficiency, jobs, and education. This methodology is suitable for the research objectives, as it will enable identification and analysis of extant knowledge and best practices in the field (Creswell, 2014). In line with Peters et al. (2020), this approach

will allow us to systematically search for and screen relevant studies, particularly both quantitative and qualitative research designs, grey literature, and expert opinions. The inclusion criteria will focus on studies that explore impacts of ChatGPT on access, efficiency, jobs, and education, published in English language journals from 2022 to 2023.

The initial step in this study involves conduct of a comprehensive review of academic and professional literature related to the impacts of ChatGPT on access, efficiency, jobs, and education. The review includes journal articles, books, reports, and other relevant sources, guided by research objectives; the sources are selected based on their relevance to research objectives (Grant and Booth, 2009; Creswell, 2014). The literature review is conducted via databases such as Google Scholar, JSTOR, and ProQuest.

We follow the guidelines proposed by Snyder (2019) and Paul and Criado (2020) for writing a comprehensive literature review. This includes the synthesis of key findings from included studies, critical evaluation of quality and limitations of research, and identification of future research directions. These rigorous methodology guidelines provide a comprehensive overview of current state of research on the impacts of ChatGPT on access, efficiency, jobs, and education, and help identify knowledge gaps and future research directions.

According to Grant and Booth (2009), an appropriate sample size for a literature review will depend on the research questions, scope of review, and available resources. For this study, the appropriate sample size for the literature is determined by a preliminary search to identify the number of relevant studies or articles. 74 articles are identified through a database search and by review of reference lists of key articles on the topic. This sample size is justified based on fact that studies identified are of high quality and provide rich and relevant data that address research questions (Bettany-Saltikov, 2010).

According to Fink (2014), there are several sampling techniques that can be used in a literature review, particularly convenience sampling, random sampling, stratified sampling, and purposive sampling. This study adopts purposive sampling because it involves selection of studies based on their relevance to research objectives, as determined by researchers' expertise and knowledge of field (Fink, 2014). In this study, purposive sampling is accomplished through various methods, for example, the use of specific keywords to search for relevant studies in databases (e.g., PubMed or Google Scholar). The researchers then screens the studies based on their relevance to research objectives.

## 4 ChatGPT Impacts on Access-efficiency

Existing studies cover a wide range of topics related to the ChatGPT impacts on access/efficiency, as shown in Table 1. The different studies on ChatGPT reveal its potential to transform efficiency in various fields such as education, healthcare, journalism, and research. One common thread is the potential of ChatGPT to revolutionize access to information. Hopkins et al. (2023), for example, highlight how ChatGPT can provide cancer patients with 24/7 access to information, support, and advice; such leads to improvement in their quality of life. Zuccon and Koopman (2023) reported that prompt information significantly improved accuracy of ChatGPT's answers in health-related questions. Similarly, Noy and Zhang (2023) suggest that the use of generative AI can increase productivity in certain tasks, such as brainstorming and idea generation. Gabrielson et al. (2023) found that ChatGPT showed promise in improving efficiency of urologists by reduction of documentation time and provision of clinical decision support. The findings suggest that the use of ChatGPT to access various fields such as healthcare, education, and business can have both positive and negative implications. From the perspective of technological determinism theory, the introduction of ChatGPT can lead to a paradigm shift in healthcare, education, and business which can lead to the improvement of patients' quality of life by provision of 24/7 access to information, support, and advice. The increasing use of ChatGPT and similar models therefore has significant potential to impact various fields, including healthcare, education, and industry.

ChatGPT has had a significant impact on access and efficiency in various industries, particularly customer service, healthcare, and e-commerce. As a large language model, ChatGPT can be integrated into chatbots and virtual assistants, which can provide customers with instant and personalized support and information. This not only improves customer satisfaction but also increases the efficiency of customer service operations. The fact that ChatGPT can handle multiple requests simultaneously reduces the need for human support agents. ChatGPT can also be used to automate routine and repetitive tasks (e.g., data entry and scheduling) which further improves operational efficiency.

Moreover, ChatGPT can improve access to information and services for individuals with disabilities or language barriers. For example, ChatGPT can be used to develop speech-to-text and text-to-speech tools, which make it easier for individuals with hearing or speech impairments to communicate and access information. Similarly, ChatGPT can be used to develop translation tools that can assist non-native speakers of a language to understand and communicate in a foreign language. In this way, ChatGPT can help break down linguistic barriers and promote equal access to information and services.

Table 1. ChatGPT Impacts on Access-efficiency

Authors/data	Research	Mathodology	Pacults / implications
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			The use of ChatGPT in providing information to
Hopkins et al.	To examine the impact of		cancer patients represents a paradigm-shift in
(2023)	ChatGPT on cancer	Literature review	healthcare. It can provide 24/7 access to

information.         patients' quality of life.           Iand and Wang         To explore how AI and GPT could impact.         ChatGPT can enhance information access and retrieval, personalization, and acficiency in academia and ibraries.         Literature review           (2023)         To explore the role of ChatGPT in public health.         Literature review         ChatGPT in the isset to analyze health -related data, generate plateint -specific recommendations (acces)           Biswas (2023)         To explore the role of ChatGPT in public health.         Literature review         ChatGPT in a bust of analyze health -related data, generate platein -specific recommendations (and price) spectra by a platein on in natural language processing, chatbots, language translation, and creative writing. It can also have social impacts.           Abdullah et al. (2022)         To provide an overview of ChatGPT fundamentals, applications, send social impacts.         Literature review         ChatGPT has employment disruption, information control, and ethical concerns.           Yo and Zhang (2023)         To explore the applications, benefits, and rake of using ChatGPT for To explore the impact of ChatGPT an enhance library reference services.         ChatGPT has the potential to inprove business processes and outcomes, but carvallo consideration business sectors.           To explore the potential road shares estores.         To examine the possible impact of ChatGPT for library reference services.         Literature review of ChatGPT has shappidferming, but ethical and privacy concerns and accurate responses to user generis, but librarianes must ensure chical and privacy concerns aread di		patients' access to		information, support, and advice, thus improving
Land and Wang (2023)       To explore how AI and GPT could impact academia and libraries.       Literature review Literature review       ChafGPT can be used to analyze health-related data, generate patient-specific recommendations, and provide mend health support. However, it and bias.         Biswas (2023)       To explore the role of ChafGPT fundumentals.       Literature review this       ChafGPT can be used to analyze health-related data, generate patient-specific recommendations, and provide mend health support. However, it and bias.         Advallah et al. (2022)       To provide an overview of ChafGPT fundumentals.       Literature review this       ChafGPT in public health.         Advallah et al. (2022)       To provide an overview of ChafGPT fundumentals.       Literature review this       The use of generative writing. It can also have social impacts, such as employment disruption, in certain tasks, such as brainstorming and idea generation. However, it can also lead to overreliance, reduced creativity, and biased outputs.         Noy and Zhang (2023)       To explore the applications, benefits, and risks of using ChafGPT on transe gentre.       Literature review the impact of ChafGPT has the potential to revolutionize the torism industry, but ethical and privacy concerns must be addressed.         To explore the applications, benefits, and risks of using ChafGPT on therary reference services.       Literature review the induced concerns and accurate responses to user queries, but librarians must cancer thical and privacy concerns must be addressed.         To examine the possible impact of ChafGPT on theary reference services.       ChafGPT na enhapite library reference ser		information.		patients' quality of life.
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Haleem et al. (2023) ChatGPT as a support tool studies studies the need for human oversight. The study also identified potential applications of ChatGPT in		abilities and challenges of	previous studies	such as technical limitations ethical concerns and
(2023) in various domains studies identified potential applications of ChatGPT in	Haleem et al	ChatGPT as a support tool	surveys and case	the need for human oversight The study also
	(2023)	in various domains	studies	identified potential applications of ChatGPT in

			various domains such as healthcare, education,
			and finance.
	To explore the ethical		
	challenges of using		
	ChatGPT for generating		The use of ChatGPT in medical publishing raises
Liebrenz et al.	scholarly content in		ethical concerns around authorship, transparency,
(2023)	medical publishing.	Conceptual study	and bias, which must be addressed.
	To explore the impact of		ChatGPT and LLMs have the potential to improve
	ChatGPT and large		accuracy and efficiency in nuclear medicine.
	language models on	Literature review,	However, there are concerns about bias and the
	nuclear medicine.	expert opinions	need for human oversight.
	To provide a		ChatGPT and generative conversational AI have
	multidisciplinary		the potential to revolutionize various industries
	perspective on the		and fields, but there are also concerns about
	opportunities, challenges,		ethics, privacy, and the need for human oversight.
	and implications of		Collaboration between experts from various
	ChatGPT and generative	Literature review,	disciplines is needed to fully understand and
	conversational AI.	expert opinions	harness their potential.
~	To evaluate the potential of	Retrospective	ChatGPT showed promise in improving efficiency
Gabrielson et al.	ChatGPT to improve the	analysis of patient	by reducing documentation time and providing
(2023)	efficiency of urologists.	data, survey	clinical decision support.
		A dataset of 1,000	
		systematic review	
	m · · · · 1 · 1	queries and	The study found that ChatGPT performed
	To investigate whether	comparison of	comparably to the baseline methods on the MAP
	ChatGP1 can write an	ChatGP1 with	metric and outperformed them on the recall
Wang at al	effective Boolean query for	Daseline methods	metric. ChatGP1 showed potential as an effective
(acce)	litoroturo cooreb	(DM25 and PMost PEPT)	tool for generating boolean queries for systematic
(2023)		Evaluated ChatCPT's	Teview interature search.
		performance in	
		answoring health	
		related questions	The study found that prompt information
		The evaluation	significantly improved the accuracy of ChatGPT's
		metrics used were	answers ChatGPT's performance was better on
		accuracy mean	the high-quality answer dataset than on the
		reciprocal rank	Google search result dataset. The study also found
	To investigate how prompt	(MRR), and	that MRR and NDCG were useful evaluation
	knowledge impacts health	normalized	metrics for assessing the quality of ChatGPT's
	answer correctness when	discounted	answers. The study highlights the importance of
Zuccon and	using ChatGPT as a	cumulative gain	prompt information when using conversational
Koopman (2023)	conversational agent	(NDCG).	agents for health-related questions.
. , ,			The study found that ChatGPT was able to provide
			accurate information in ophthalmology and had a
			high degree of success in responding to patient
		Retrospective study	inquiries. However, it also showed limitations in
	To evaluate the	using a dataset of	some areas, such as understanding the context and
	performance of ChatGPT in	medical	tone of the conversation. The study suggests that
	ophthalmology and analyze	consultations with	ChatGPT can be a useful tool for ophthalmology,
Antaki et al.	its successes and	10 ophthalmologists	but its limitations need to be considered in clinical
(2023)	shortcomings.	and ChatGPT.	practice.
			The case study highlights the potential of ChatGPT
			in transforming different fields, such as education,
			healthcare, and journalism. It also discusses the
	The immediate if of a copy		etnical concerns associated with the use of
	is a world abar and all		chalder 1, such as plases and data privacy. The
	is a world changer and now		study concludes that UnatGP1 has the potential to
Mathew (2000)	aroas	Case study	needs to be ansured
mattlew (2023)	To examine the impact of	Case study	ChatCPT improved the efficiency of the library
	ChatCPT on traditional	Case study	system by reducing response time and increasing
Verma (2022)	library management	interviews survey	accessibility
verina (2023)	instaty management.	interviews, survey	accessionity.

# **5** ChatGPT Impacts on Employment

The literature has shown that ChatGPT has the potential to significantly impact labor market and various industries (see Table 2). Felten et al. (2023) predict that technology will lead to job displacement in some sectors while creating new job opportunities in others; policymakers should prepare for these changes. Zarifhonarvar (2023) finds similar results through econometric analysis, with emphasis on the need for upskilling and reskilling programs to help workers transition into new roles. However, Lahvis (2023) argues that the introduction of ChatGPT is likely to exacerbate extant inequalities in labor market; policymakers should work to ensure that its benefits are distributed equitably. Tiwary (2023) finds that while most people had a positive view of AI and ChatGPT, concerns were raised about job displacement and ethical considerations.

The social construction of technology theory suggests that ChatGPT's impact on labor market and various industries will depend on how it is socially constructed and used. While some researchers predict job displacement in some sectors, others emphasize potential for creating new job opportunities and need for upskilling and reskilling programs to help workers transition to new roles. Additionally, Lahvis argues that policymakers must ensure that ChatGPT's benefits are distributed equitably to avoid exacerbating existing inequalities in labor market. Therefore, how society constructs and uses ChatGPT will determine its impact and whether its benefits are distributed equitably.

As a large language model, ChatGPT has had significant impacts on employment, particularly in the field of natural language processing and artificial intelligence. The development of such models has led to increased demand for skilled professionals in these areas, particularly software engineers, data scientists, and linguists. Further, the use of ChatGPT in various industries, such as healthcare, finance, and e-commerce, has led to the creation of new job roles and opportunities. Companies now seek individuals with experience in natural language processing to develop and implement ChatGPT-based solutions that can improve business operations, enhance customer experience, and increase productivity.

On the other hand, the use of ChatGPT and other large language models has also raised concerns about the potential displacement of human workers. As these models become increasingly sophisticated, they have the potential to replace certain jobs that involve human language processing, such as customer service representatives, content writers, and translators. However, it is important to note that while ChatGPT can automate certain tasks, it cannot fully replace human intelligence, creativity, and empathy. Instead, the use of ChatGPT can free up human workers from mundane and repetitive tasks, allowing them to focus on more complex and higher-value work that requires critical thinking and problem-solving skills. Therefore, while there may be some short-term displacement of jobs, the long-term impacts of ChatGPT on employment may lead to the creation of new and more meaningful job opportunities.

	Pasaarah		
Authors/Date	Objectives/Ouestions	Methodology	Results/Implications
			The authors predict that ChatGPT will have
			significant impacts on the labor market, with some
	To explore the impact of		jobs being replaced while others will require new
	language models such as	Literature	skills. They also suggest that policymakers should
Felten et al.	ChatGPT on industries and	review and	prepare for these changes and work to mitigate
(2023)	occupations	expert opinions	negative consequences.
			The author finds that the introduction of ChatGPT is
			likely to cause job displacement in some sectors, but
	To analyze the labor market	Econometric	also create new job opportunities in others. The paper
Zarifhonarvar	impacts of ChatGPT from an	analysis and	emphasizes the need for upskilling and reskilling
(2023)	economic perspective	literature review	programs to help workers transition into new roles.
	To investigate the impact of	Experimental	
	ChatGPT on psychological	study with pre-	The authors find that interacting with ChatGPT can
	well-being, with a focus on	and post-	have a positive impact on self-esteem and well-being,
Salah et al.	harmful stereotypes and job	intervention	and that harmful stereotypes and job anxiety do not
(2023)	anxiety as moderators	surveys	significantly moderate these effects.
			The author argues that the introduction of ChatGPT
			is likely to exacerbate existing inequalities in the
	To explore the implications	Literature	labor market, and suggests that policymakers should
	of ChatGPT for labor and	review and	work to ensure that the benefits of AI are distributed
Lahvis (2023)	employment	expert opinions	equitably.
			The author finds that initial reactions to ChatGPT
		Social media	were largely positive, with many users expressing
		analysis and	excitement about its potential applications. However,
Taecharungroj	To analyze public reactions	sentiment	there were also concerns about job displacement and
(2023)	to ChatGPT on Twitter	analysis	ethical considerations.

**Table 2.** Related literature on ChatGPT Impacts on employment

			The author suggests that ChatGPT has the potential
			to revolutionize various industries and fields, and that
	To discuss potential future	Literature	future research should explore the ethical and societal
	directions and applications of	review and	implications of its use. The paper also highlights the
Aljanabi (2023)	ChatGPT	expert opinions	importance of continued innovation in the field of AI.
	To explore the potential of		
	ChatGPT in higher education		ChatGPT can be used for personalized learning,
	and professional	Literature	training, and professional development in various
Atlas (2023)	development	review	fields.
	To analyze the opportunities		ChatGPT can improve efficiency and accuracy in
	and risks of ChatGPT in		various aspects of medicine, science, and academic
	medicine, science, and	Literature	publishing, but ethical and legal considerations need
Homolak (2023)	academic publishing	review	to be addressed.
	To examine the opinions of		
	netizens, academicians, and		
	information professionals		Most participants had a positive view of AI and
	about AI, with a special		ChatGPT, but concerns were raised about job
Tiwary (2023)	reference to ChatGPT	Online survey	displacement and ethical considerations.
		Literature	
	To examine the potential	review,	ChatGPT has the potential to create new jobs and
Zarifhonarvar,	economic impact of ChatGPT	economic	change the nature of existing jobs. However, it may
(2023)	on the labor market.	analysis	also lead to job displacement in certain sectors.

### 6 ChatGPT Impacts on Education

The impact of ChatGPT on education has been a topic of interest for researchers in different fields (see Table 4). A systematic review by Sallam (2023) highlighted the potential of ChatGPT in healthcare education, research, and practice; however concerns about its impact on patient privacy, security, and trust need to be addressed. In contrast, Baidoo-Anu and Owusu Ansah (2023) conducted a literature review and identified potential benefits of ChatGPT in promoting teaching and learning in education. ChatGPT has the potential to enhance personalized learning, encourage student engagement, and facilitate the development of critical thinking skills.

Other researchers have also discussed the potential of ChatGPT in enhancing specific fields, such as science education (Cooper, 2023), medical education (Eysenbach, 2023; Hisan and Amri, 2023), foreign language teaching and learning (Hong, 2023), and tourism education (Ivanov and Soliman, 2023; Skavronskaya et al., 2023). Kalla and Smith (2023) find that ChatGPT can enhance research capabilities in various fields, while Atlas (2023) suggests that it can be used for personalized learning, training, and professional development.

ChatGPT has had significant impacts on education, particularly in the areas of language learning and personalized education. As a large language model, ChatGPT has the ability to generate natural language responses to a wide range of questions and prompts, which makes it a valuable tool for language learners. ChatGPT can provide instant feedback, explanations, and examples. This way it helps learners to improve their grammar, vocabulary, and comprehension. ChatGPT can also be used to create interactive and engaging learning experiences (e.g., chatbots and virtual assistants), that can personalize the learning process and adapt to the needs and preferences of individual learners.

Moreover, ChatGPT can also enhance the accessibility and inclusivity of education by provision of support for students with disabilities or language barriers. For example, ChatGPT can be used to develop speech-to-text and text-to-speech tools, which make it easier for students with hearing or speech impairments to participate in class. Similarly, ChatGPT can be used to develop translation tools that can assist non-native speakers of a language to understand and communicate in a foreign language. In this way, ChatGPT can help to break down linguistic barriers and promote equal access to education for all students.

Table 3.	Related	literature on	ChatGPT	impacts on	education
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Authons /Data	Research	Mathadalagy	Desults /Implications
Authors/Date	Objectives/Questions	Methodology	Results/implications
	To review the utility of		
	ChatGPT in healthcare		ChatGPT can provide promising perspectives for
	education, research, and		healthcare education, research, and practice, but valid
	practice and identify valid	Systematic	concerns about its impact on patient privacy, security, and
Sallam (2023)	concerns	review	trust need to be addressed.

	To understand the		
	potential benefits of		
Baidoo-Anu,	ChatGPT in promoting		ChatGPT has the potential to enhance personalized
and Owusu	teaching and learning in		learning, encourage student engagement, and facilitate
Ansah (2023)	education	Literature review	the development of critical thinking skills in education.
			chatGP1 can enhance medical education by providing
	To discuss the potential		niteractive simulations, adaptive learning, and
	impact of ChatGPT on		research by analyzing large datasets and generating
	medical education and		hypotheses. However, it also raises ethical concerns about
Arif et al. (2023)	research.	Literature review	patient privacy, data quality, and accountability.
	To investigate the role of		
	ChatGPT in scientific		ChatGPT can assist non-native English-speaking authors
	writing, reviewing, and		in improving their writing, especially in terms of grammar
Tong (0000)	editing for open-access	Casa study	and syntax. However, it cannot replace human editors in
1 elig (2023)	TESOL journais.	Case study	ChatGPT can provide opportunities for pursing education
	To identify the challenges		such as enhancing clinical decision-making and
	and opportunities of		promoting critical thinking However challenges such as
Alkhagani	using ChatGPT in nursing		lack of resources and limited access to technology need to
(2023)	education	Literature review	be addressed.
	To explore ChatGPT user		ChatGPT has the potential to enhance student
	experience and its		engagement and learning experience in education, but
Zhai (2022)	implications for education	Survey	privacy concerns need to be addressed.
	To examine the promises		ChatGPT can provide opportunities for software testing
	and perils of ChatGP1 in		education such as enhancing student engagement and
Ialil etal (2022)	education	Survey	automating repetitive tasks. However, concerns about
Jain etai. (2023)	To explore the	Survey	accuracy and security need to be addressed.
	implications of ChatGPT		ChatGPT can enhance personalized learning and provide
Ivanov and	for tourism education and		opportunities for research in tourism education. However,
Soliman (2023)	research	Literature review	ethical and privacy concerns need to be addressed.
	To examine the impact of		ChatGPT has the potential to enhance foreign language
	ChatGPT on foreign		teaching and learning by providing personalized feedback
Hang (acca)	language teaching and	Litanatuna narriaru	and enhancing communication skills. However, concerns
Holig (2023)	learning	Literature review	about the lack of human interaction need to be addressed.
	To conduct a SWOT		learning and weaknesses such as accuracy and security
	analysis of ChatGPT and		concerns Opportunities include promoting critical
	identify implications for		thinking and threats include lack of human interaction.
Farrokhnia et al.	educational practice and		Educational institutions need to address these factors to
(2023)	research	SWOT analysis	effectively incorporate ChatGPT in education.
			ChatGPT has the potential to enhance science education
			by providing personalized learning experiences,
		Onelitetion	facilitating discussion and collaboration, and improving
	To avaming the potential	Qualitative	student engagement. However, there are also concerns
	of ChatGPT to enhance	exploratory case	generated by ChatGPT as well as the ethical implications
Cooper (2023)	science education	study	of using AI in education.
		~ ~	ChatGPT has potential in medical education for
	To explore the role of		enhancing clinical reasoning skills, facilitating the
	ChatGPT, generative		creation of medical case studies, and improving patient
	language models, and		communication. However, concerns exist regarding the
Eysenbach	artificial intelligence in	Oninica nices	accuracy and ethics of using AI in medicine, and the need
(2023)	medical education	Opinion piece	ChatGPT has the potential to anhance tourism adjustion
			by providing students with a personalized learning
			experience, facilitating language learning and cultural
			exchange, and improving student engagement. However.
	Does ChatGPT have the		there are concerns about the potential impact of AI on
Skavronskaya et	potential to enhance		employment in the tourism industry, as well as the ethical
al. (2023)	tourism education	Opinion piece	implications of using AI in education.

			ChatGPT has potential in higher education for facilitating
			personalized learning experiences, improving student
		Qualitative	engagement, and enhancing the efficiency of assessment
	To examine the potential	research design:	processes. However, concerns exist regarding the accuracy
Malinka et al	of ChatGPT in higher	exploratory case	and reliability of the information generated by AL as well
(2023)	education	study	as the ethical implications of using AI in education
(2023)		Study	ChatGPT has the potential to enhance medical education
			by facilitating personalized learning experiences
			improving clinical reasoning skills, and onhancing the
			afficiency of medical accostudios. However, concerns evict
	To complete the notential		enciency of medical case studies. However, concerns exist
TT:	of the potential		regarding the accuracy and ethics of using AI in medicine,
Hisan and Amri	of ChatGP1 in medical	0	and the need to balance numan judgement and machine
(2023)	education	Opinion piece	learning.
			ChatGPT has the potential to enhance higher education by
			facilitating personalized learning experiences, improving
			student engagement, and enhancing the efficiency of
			assessment processes. However, concerns exist regarding
	To examine the potential		the accuracy and reliability of the information generated
Rudolph et al.	of ChatGPT in higher		by AI, as well as the ethical implications of using AI in
(2023)	education	Opinion piece	education.
			ChatGPT has potential in education for enhancing student
			engagement, improving language learning and
	To explore the potential	Qualitative	communication skills, and facilitating personalized
	of ChatGPT in higher	research design:	learning experiences. However, concerns exist regarding
Tlili et al. (2023)	education	case study	the accuracy and reliability of the information generated
	To examine the	•	ChatGPT can support personalized and adaptive learning,
	opportunities and	Literature review	enhance student engagement, and facilitate content
Kasneci et al.	challenges of ChatGPT for	and critical	creation. However, there are also concerns about potential
(2023)	education	analysis	biases, data privacy, and ethical considerations.
			ChatGPT achieved 80% accuracy in grading anatomy
	To evaluate the use of		essays which is comparable to human graders. However
Talan and	ChatGPT as an	Experimental	it also highlighted the importance of designing
Kalinkara	assessment tool for an	study with 20	appropriate prompts and providing clear instructions for
(2022)	anatomy course	narticinants	students
(2023)	anatomy course	participants	ChatCPT can facilitate writing and research tacks, but it
	To discuss the		also raises questions about authorship intellectual
	implications of ChatCPT	Litoroturo roviow	also faises questions about authorship, intellectual
	for advection research	and aritical	property, and authenticity. Moreover, it can remote
Dishan (2000)	ior education, research,	and critical	existing blases and perpetuate misinformation if not
Bisnop (2023)	and writing	analysis	property trained and evaluated.
			ChatGPT can assist in writing, editing, and peer-reviewing
	To examine the impact of		academic manuscripts. It can also automate certain
	artificial intelligence,		publishing processes and reduce publication costs.
	including ChatGPT, on		However, it also raises concerns about authorship,
Curtis (2023)	academic publishing.	Literature review	plagiarism, and the role of human editors and reviewers.
			ChatGPT can be a useful tool to supplement English
			language learning, particularly for providing instant
			teedback, generating creative ideas, and improving
	To investigate the impact	Survey of	speaking and writing skills. The study found that both
	of ChatGPT on motivation	teachers and	teachers and students had positive attitudes towards
	tor learning English	students in a	ChatGPT, but some concerns were raised, such as the
	among teachers and	Saudi Arabian	need for human interaction and the lack of
Ali et al. (2023)	students	university	personalization.
		A population-	
		level vaccine	
		effectiveness	
		analysis as input	
		to ChatGPT and	The study found that ChatGPT was able to draft a research
		evaluation using	article that achieved a moderate level of quality, with high
	To investigate whether	human	fluency but lower adequacy and coherence. The study
	ChatGPT can draft a	evaluation	suggests that ChatGPT can potentially save time and effort
	research article using	metrics	for researchers by automating some of the drafting
	population-level vaccine	(adequacy,	process of research articles. However, the authors caution
Macdonald et al.	effectiveness analysis as	coherence, and	that human editing is still necessary to improve the
		. /	

		automated	
		metrics (ROUGE	
		and BLEU).	
	To investigate the	A dataset of	
	potential of using	USMLE-style	
	ChatGPT as an AI-	questions. The	
	assisted tool for medical	evaluation	The study found that ChatGPT's performance was
	education, specifically for	metrics used	comparable to that of human examinees on the USMLE
	the United States Medical	were accuracy,	questions, with high accuracy and F1-score. ChatGPT's
Kung et al.	Licensing Examination	F1-score, and	time to answer was much shorter than that of human
(2023)	(USMLE)	time to answer.	examinees.
			The study found that ChatGPT was not able to perform
			well in answering medical physiology questions in the
			university examination. However, it showed potential in
		Quantitative	providing hints and guiding students in their learning
	To evaluate the	research	process. The study suggests that ChatGPT can be a useful
	performance of ChatGPT	involving 125	tool for students to enhance their learning and
Subramani et al.	in medical physiology	medical students	understanding of the subject, but it cannot replace human
(2023)	university examination.	and a test.	expertise in the evaluation process.
			The study found that the use of ChatGPT improved the
			academic performance of university students, especially in
			writing assignments and exams. ChatGPT was found to be
	To explore the role of		a useful tool in enhancing students' learning and
	ChatGPT in enhancing		understanding of the subject. The study suggests that
	academic performance in		ChatGPT can be integrated into the educational system to
Alshater (2022)	higher education.	Case study	enhance the quality of education and learning outcomes.
		Quantitative	
		survey research	The study found that ChatGPT was frequently used by
	To explore the frequency	involving 100	university students to enhance their productivity.
Firaina and	and impact of using	university	Students reported that the use of ChatGPT improved their
Sulisworo	ChatGPT on productivity	students and a	productivity in academic tasks such as writing
(2023)	in higher education.	questionnaire.	assignments and conducting research.
			The authors find that ChatGPT has the potential to greatly
	To examine the impact of	a 1	enhance research capabilities in various fields. They also
Kalla and Smith	ChatGPT on different	Survey and	suggest that future research should explore ethical
(2023)	fields of study	literature review	considerations surrounding the use of AI in research.
D ut to Oli	To examine the potential		ChatGP1 can be used to enhance legal education by
Pettinato Oltz	of ChatGPT in legal	a . 1	providing interactive and personalized learning
(2023)	education	Case study	experiences.
	To explore the potential		ChatGPT can be used for medical education in various
	ot ChatGPT in medical		ways, such as virtual patient simulations and personalized
Lee (2023)	education	Literature review	learning.

# 7 ChatGPT Impacts and Ethics

Most of the studies in Table 1-3 suggest that ChatGPT has limitations that need to be considered in practice. Antaki et al. (2023) reported that ChatGPT can provide accurate information in ophthalmology, but its limitations in understanding context and tone of conversation need to be addressed. Likewise, Subramani et al. (2023) found that ChatGPT was not able to perform well in answering medical physiology questions in university examination. It only showed potential in the provision of hints and the guide to students in their learning process. In context of healthcare, an AI model such as ChatGPT may make recommendations that are not suitable for certain populations due to underrepresentation of these populations in training data (Sallam, 2023).

Lund and Wang (2023), and Biswas (2023) argue that it poses ethical concerns such as privacy, bias, and control over data. Similarly, Arif et al. (2023) discuss ethical concerns about patient privacy, data quality, and accountability. Curtis (2023) raises concerns about authorship, plagiarism, and the role of human editors and reviewers in academic publishing. Iskender (2023) emphasizes need to use the technology responsibly, while Taecharungroj (2023) finds that there were concerns about ethical considerations in public reactions to ChatGPT on Twitter. Homolak (2023) also highlights importance of addressing ethical and legal considerations in use of ChatGPT. Beerbaum's (2023) conceptual study highlights the need for a Generative Artificial Intelligence (GAI) Ethics Taxonomy to mitigate ethical risks associated with ChatGPT; the study argues that the use of ChatGPT in GAI-RPA requires careful consideration of ethical issues.

In line with the reviewed studies, the development and use of ChatGPT has raised numerous ethical concerns, particularly in areas of privacy, fairness, and transparency. As a large language model that relies on vast amounts of data to generate

responses, ChatGPT raises questions regarding the collection, storage, and use of personal data. There is a risk that personal information may be inadvertently shared or misused, which could lead to breaches of privacy and security. Moreso, the use of ChatGPT in decision-making processes raises concerns about fairness and accountability, as well as the potential for bias and discrimination.

Further, the development and use of ChatGPT raise broader ethical questions about the role of artificial intelligence in society. As ChatGPT becomes increasingly sophisticated and ubiquitous, it raises questions about its potential impact on employment, education, and social interaction. There is a risk that the widespread use of ChatGPT may lead to the displacement of certain jobs, the automation of certain tasks, and the loss of human interaction and socialization. There is also a risk that ChatGPT may perpetuate existing biases and stereotypes in the data on which it is trained, which might lead to discriminatory outcomes. Therefore, it is important to carefully consider the ethical implications of ChatGPT and to ensure that it is developed and used in a way that respects privacy, promotes fairness, and mitigates the potential for bias and discrimination (Beerbaum, 2023; Iskender, 2023).

However, the use of ChatGPT in education also raises concerns about the potential for over-reliance on technology and the loss of human interaction and socialization. While ChatGPT can provide valuable feedback and support, it cannot fully replace the benefits of face-to-face interactions with teachers and peers. The use of ChatGPT in education may also require additional resources and training for teachers to effectively integrate the technology into the classroom. Therefore, while ChatGPT has the potential to transform education, it is important to carefully consider its impacts and limitations and to ensure that it is used in a way that complements, rather than replaces, human teachers and interactions.

#### 8 Discussion

The use of ChatGPT in various fields can bring about both positive and negative implications, and its potential to revolutionize industries such as healthcare, education, and business must be carefully considered in light of ethical and privacy concerns (Arif et al., 2023; Biswas, 2023; Curtis, 2023; Lund & Wang, 2023, Taecharungroj, 2023). Technological determinism theory suggests that the introduction of ChatGPT can lead to a paradigm shift in different sectors, providing 24/7 access to information, support, and advice, but it also raises concerns about privacy, bias, and control over data. Similarly, in academic and library settings, ChatGPT can enhance information access and retrieval, personalization, and efficiency, but it can also lead to overreliance, reduced creativity, and biased outputs. In medical education and research, ChatGPT has significant impacts, but ethical concerns around patient privacy, data quality, and accountability must be addressed. Ethical guidelines and best practices must be implemented to mitigate potential risks and ensure responsible use of technology (Arif et al., 2023; Biswas, 2023; Curtis, 2023; Lund & Wang, 2023, Taecharungroj, 2023).

The social construction of technology theory suggests that technology is not neutral, but rather shaped by social and cultural factors. use of ChatGPT in various domains highlights its potential benefits and challenges, particularly in relation to ethical concerns, bias, and human oversight. To mitigate these risks, ethical guidelines and best practices must be implemented, and human involvement should be maintained. This study also identified potential applications of ChatGPT in various domains such as healthcare, education, and finance. However, the use of ChatGPT in these areas also requires careful consideration of ethical issues and potential risks. While ChatGPT has the potential to revolutionize various fields, ethical concerns and human oversight must be maintained to ensure its safe and effective use.

Studies on ChatGPT reveal its potential to transform various fields such as education, healthcare, journalism, and research. However, some studies suggest that ChatGPT has limitations in understanding context and tone of conversation, and it may not perform well in answering certain types of questions. Moreover, ethical concerns associated with use of ChatGPT, such as bias and data privacy, need to be addressed.

The use of ChatGPT can save time and effort for researchers, improve the efficiency of library systems, and reduce documentation time for urologists. However, its potential in transforming fields must be accompanied by responsible use, addressing its limitations and ethical concerns. According to social construction of technology theory, technology is not an objective or neutral force, but rather is shaped by social and cultural factors. Studies on ChatGPT highlight the importance of considering social and ethical concerns and suggest that technology must be integrated and adapted to suit specific contexts and social practices. The studies on ChatGPT highlight the importance of considering social and cultural factors that shape its use and impact in different contexts.

The introduction of ChatGPT is expected to have a significant impact on various industries and labor market. According to technological determinism theory, this impact will be determined by technology itself, independent of social and cultural factors. While technology is predicted to create new job opportunities in some sectors, it may also displace jobs in others, highlighting the need for upskilling and reskilling programs. Moreover, ethical considerations such as responsible use of technology must be addressed to ensure that benefits are distributed equitably and that existing inequalities in labor market are not exacerbated.

However, social construction of technology theory suggests that impact of ChatGPT on labor market and various industries will depend on how it is socially constructed and used. While some researchers predict job displacement in some sectors, others emphasize potential for creating new job opportunities and the need for upskilling and reskilling programs to help workers

transition into new roles. Additionally, positive impact of ChatGPT on various fields, including research, education, and healthcare, depends on its social construction and use. Its advanced language processing capabilities can be used in various industries, but ethical considerations must be addressed to use technology responsibly.

In field of education, ChatGPT is expected to have both opportunities and challenges, as identified by social construction of technology theory. While it has the potential to enhance personalized learning, encourage student engagement, and promote critical thinking skills, there are concerns about accuracy, reliability, security, privacy, and ethical implications. Educational institutions need to balance human judgement and machine learning to effectively incorporate ChatGPT in education. A SWOT analysis has identified its strengths, weaknesses, opportunities, and threats for educational practice and research, and educational institutions need to address these factors to effectively incorporate ChatGPT in education.

To prepare for impact of ChatGPT, policymakers and organizations must ensure that benefits are distributed equitably and ethical considerations are addressed. Educational institutions must balance human judgement and machine learning and consider ethical implications of using AI in education. impact of ChatGPT on labor market and various industries will depend on how it is socially constructed and used, and adoption and implementation of ChatGPT will depend on social and cultural factors. Therefore, it is important to carefully consider implications of using ChatGPT and address any concerns before implementing it in various fields.

## **9** Conclusion

The literature review highlights the potential benefits and challenges associated with the use of ChatGPT in various fields such as healthcare, education, and business. The technological determinism theory suggests that ChatGPT has the potential to revolutionize industries by providing 24/7 access to information, support, and advice. However, ethical concerns around privacy, bias, and control over data must be considered to ensure responsible use of the technology. The implementation of ethical guidelines and best practices can help mitigate potential risks and ensure its safe and effective use.

The social construction of technology theory suggests that technology is shaped by social and cultural factors, and therefore, the impact of ChatGPT on various domains must be considered in light of ethical concerns, bias, and human oversight. The literature review highlights the various limitations of ChatGPT, particularly in understanding context and tone of the conversation. The literature reviewed also highlights the need to maintain human involvement and implement ethical guidelines and best practices to address these concerns. While ChatGPT has the potential to bring significant changes to various fields, its limitations and ethical concerns need to be carefully considered.

Moreover, in line with the social construction of technology theory, the impact of ChatGPT on the labor market and various industries will depend on how it is socially constructed and used. While some studies predict job displacement in some sectors, others emphasize the potential for creating new job opportunities and the need for upskilling and reskilling programs to help workers transition to new roles. Thus, the positive impact of ChatGPT on various fields, including research, education, and healthcare, depends on its social construction and use.

In the field of education, ChatGPT has the potential to enhance personalized learning, encourage student engagement, and promote critical thinking skills. However, accuracy, reliability, security, privacy, and ethical implications must be considered. Educational institutions must balance human judgement and machine learning and consider the ethical implications of the use of AI in education. Increased research can help identify the strengths, weaknesses, opportunities, and threats to educational practice and research.

#### 9.1 Policy Recommendations

Based on the literature reviewed, the following policy recommendations can be made to ensure the responsible use of ChatGPT in various fields. First, ethical guidelines and best practices must be implemented to mitigate potential risks and ensure responsible use of the technology. Policymakers and organizations should collaborate with experts in AI and ethics to develop comprehensive guidelines that address concerns around privacy, bias, and control over data. These guidelines should be regularly reviewed and updated to reflect the evolving landscape of AI technology.

Second, human involvement should be maintained in the use of ChatGPT. While technology has the potential to enhance efficiency and productivity, it should not replace human judgement entirely. Also, policymakers and organizations can invest in training and reskilling programs for workers whose jobs may be impacted by the adoption of ChatGPT. This will help ensure a smooth transition to the new technology and reduce the risk of job displacement.

Third, educational institutions must balance human judgement and machine learning to effectively incorporate ChatGPT in education. This includes addressing concerns around accuracy, reliability, security, privacy, and ethical implications. Educational policymakers and organizations should collaborate with experts in AI and education to develop comprehensive guidelines and best practices for the use of ChatGPT in education. This will help ensure that the technology is effectively integrated into existing educational practices and does not compromise the quality of education.

Fourth, the impact of ChatGPT on the labor market and various industries must be carefully considered. Policymakers and organizations should collaborate with experts in labor market analysis to identify the potential impact of ChatGPT on different

sectors and design appropriate policies and programs to mitigate likely job displacement. This may include upskilling and reskilling programs, job placement services, and social safety nets for affected workers.

Finally, the social and cultural factors that shape the use and impact of ChatGPT in different contexts must be considered. Policymakers and organizations should collaborate with experts in social and cultural studies to identify the potential social and cultural implications of the adoption of ChatGPT and design appropriate policies and programs to address these concerns. This will help to ensure that the technology is effectively integrated into existing social and cultural practices and does not compromise the values and norms of different communities.

#### 9.2 Future Research Directions

Despite the numerous benefits and potential applications of ChatGPT, there are still several limitations that need to be addressed, and future research can help to improve the technology and mitigate potential risks. Some studies suggest that ChatGPT may struggle to understand the context and tone of the conversation, and may not perform well in answering certain types of questions. To overcome these limitations, researchers can explore ways to improve the technology's ability to understand nuances in language and context. Ethical concerns (e.g., biases and data privacy) need to be addressed, and further research can help to develop ethical guidelines and best practices for the responsible use of ChatGPT. Future research can also explore the impact of ChatGPT on society and culture, including its potential to exacerbate existing inequalities and impact the labor market.

In addition to addressing the limitations of ChatGPT, future research can also explore new applications of the technology and its potential to transform industries and society. For example, the use of ChatGPT in journalism and media can enhance the efficiency of news production and improve the quality of news reporting. In finance, ChatGPT can be used for risk management and fraud detection. Further research can also explore the potential of ChatGPT in fields such as law, psychology, and social work. However, as ChatGPT becomes more widely used, it is important to ensure that ethical considerations are taken into account and that the technology is used responsibly. On the whole, future research can help to maximize the potential benefits of ChatGPT while mitigating potential risks and ethical concerns.

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