

Special Topic: The Impact of ChatGPT in Society, Business, and Academia

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ABSTRACT

ChatGPT has had a significant impact on society, business, and academia by influencing individuals and organizations through knowledge generation and supporting users in locating conversational inquiries and answers. It can transform how people seek answers by combining human-like conversational skills with AI. By eradicating the cumbersome process of selecting from multiple options, users can conduct preliminary research or create optimized solutions. The purpose of this research is to investigate how consumers use ChatGPT and digital transformation, specifically in terms of knowledge development, searching and recommending, and optimizing accessible possibilities. Using many linked theories, we address the potential implications and insights that can be gained from ChatGPT's early stages and its integration with other applications such as robotics, service automation, and the metaverse. Finally, the application of ChatGPT has practical, theoretical, and phenomenological impacts, in addition to improving users' experiences.

Keywords: ChatGPT, Artificial Intelligence (AI), Search, Recommendation, Choice, User Experiences, Decision-Making Process

I . Introduction

Since November 30, 2022, ChatGPT has had a significant impact on daily life, business, and academics. Within only 2 months, it had 100 million users (Milmo, 2023). ChatGPT has the potential to

revolutionize many aspects of human life, just like the Internet. ChatGPT is one of the best illustrations of human-machine communication, and it has revolutionized interactions between users and Artificial Intelligence (AI). The fundamental feature of ChatGPT is its capacity to effectively use AI. For

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users, user's background knowledge, which enables them to pose insightful questions, and their questioning creativity can influence the outcomes. This is of great significance in finding potential solutions by asking ChatGPT analogical questions. The most surprising aspect is that ChatGPT provides users with creative and viable solutions in a convincing way (Kim et al., 2023).

By being able to hold conversations, ChatGPT has the ability to ask subsequent questions, acknowledge errors in its responses, highlight flawed assumptions, and refuse inappropriate requests. Thanks to this, users find it easy to obtain knowledgeable solutions in many fields. In practice, ChatGPT can perform a variety of tasks, including but not limited to questions and answers, generating conversations and summaries, engaging in discussions, translating text in various languages, writing essays or screenplays, categorizing data, and identifying and correcting programming and code errors. However, it is currently impossible to exercise full control over all the data used to train a large model. Consequently, it may contain false or fabricated information. Thus, human intervention is required to ensure perceived accuracy, perceived trustworthiness, dependability, and precision.

The possible applications of ChatGPT will go beyond language models and combine with other AI technologies, including robots and a wide range of application services, which predicts the rise of connected new business models and the creation of a wide range of services. This will open up more possibilities for agents who help end users find solutions. We must consider how to integrate ground-breaking AI technology, such as ChatGPT, into a wide range of commercial and societal fields, as well as our education systems.

To achieve this goal, it is necessary to explore

ways of effectively and reliably using ChatGPT by integrating it with other technologies across society, business, and academia, and it is essential to maintain a focus on the field of education.

II. Conversational AI Revolution

ChatGPT is both creative and conversational. A service that retrieves existing documents is valuable but its users do not feel it is creative. However, ChatGPT generates texts, and although there are mistakes, it generates sentences quite well, giving users the sense that it is creative. It doesn't import or copy articles; it creates material that has never been seen before. The greatest implication of the ChatGPT revolution, however, is the conversational AI revolution, which is a human - computer interface revolution and the next stage in the evolution of computer - human interaction from keyboard, mouse, and touch to conversation (Dwivedi et al., 2023). Since the early 1990s, people have been predicting that computers and humans would communicate via conversations, but it hadn't happened until now. Computers and humans communicated with keyboards, then with graphical user interfaces via a mouse, then with touch screens, as with the iPod Touch. With ChatGPT, it appears possible to communicate with computers in conversation.

ChatGPT is a multi-turn question and answer model; the first machine in human history to comprehend speech well, and the first to generate conversations by comprehending context. ChatGPT understands what people are saying, even if the content it generates or replies with is deficient. We can progressively fill in the gaps. The most significant advancement is that it can understand human speech beyond Alexa and Siri. ChatGPT indicates that the

user interface of many services around the globe will become conversational. Current face-to-face and non-face-to-face services, such as health, medical, and professional counseling, may be converted into AI-based conversational counseling services. Through an interactive interface, people will be able to consult with AI, and AI will be able to advise, make recommendations, assess, and manage the results in real time to keep people satisfied and informed.

ChatGPT New Services:

- **Healthcare:** ChatGPT has already been applied to medical consultations. South Korea's GoodDoc has launched the country's first health AI chatbot using the ChatGPT application programming interface (API). The chatbot is available through the Health AI service on the GoodDoc application (app), where users can ask health-related questions and the AI will provide answers within seconds. By first answering the user's questions and then connecting them to in-person care within the GoodDoc App, such as a virtual visit, clinic marketplace, or hospital appointment, the AI makes healthcare more convenient, accessible, efficient, and friendly (Dwivedi et al., 2023).
- **Education:** Interactive services are likely to revolutionize both individual and corporate education. Ellice.io, an AI-enabled education company, has launched AI Help, an AI chatbot that helps students learn coding based on GPT 3.5. The chatbot responds to queries within the Ellis platform and is able to solve and explain code as well as fix errors (Heaven, 2023). Users can ask the chatbot for assistance by dragging in the section of code they want to ask about. Users have benefited from a reduction in response time from an average of 20 minutes to 1 minute. AI Helpline also helps novices to solve problems using a large language model (LLM) (Kasneci et al., 2023) by offering five question choices to guide them to ask more relevant questions. Education and knowledge-sharing platform Classum has launched AI Dot 2.0, an AI chatbot that uses GTP 3.5. The chatbot answers questions based on internal data and supports the work of its clients' employees. The chatbot automatically updates the available data by facilitating knowledge sharing and communication among employees, and enables companies to better use their accumulated internal data (AlAfnan, et al., 2023; Neto, 2023).
- **Finance:** Interactive service innovation in the financial industry, including banking, securities, and insurance, is just beginning (Song, 2023). The financial industry will see a proliferation of interactive service innovations within companies, and interactive service innovations in customer relationships. In the financial sector, advances in natural language processing and speech recognition technologies are expected to improve the performance of existing mobile financial apps and expand their customer base. To this end, banks are launching new financial services that use chatbots and voice recognition technology. The Bank of America's mobile app, Erica, has used deep learning technology to answer over 120 million questions. Recently, it was integrated with Merrill Lynch's investing capabilities to provide comments on portfolio performance, investment balances, quotes and holdings, and connect customers with Merrill advisors. By leveraging voice recognition technology, Erica was able to quickly expand its

customer base during COVID-19, especially among middle-aged and older adults. Kookmin Bank launched a “call bot service” for seniors, and Shinhan Bank is offering a safe conversion loan through its voice bot, Solar, and chatbot, Aurora. These new financial services are targeting middle-aged and elderly people who have difficulty using existing mobile apps, and are playing a big role in expanding the customer base (Kim et al., 2023).

- **E-commerce:** Payment interfaces will become more interactive. Voice-commerce, which has been lagging, will be revitalized. It’s the first time we’ve had an AI that understands speech that applied for a complex context, and it’s the first time we’ve had an AI that’s able to formulate a convincing conversation, which will change everything. For example: Specifications and technical information: The product is technologically advanced, with intricate technical specifications that are crucial for both the vendor and the retailer to comprehend. To facilitate effective communication, the AI must accurately comprehend these details. Pricing and Conditions: The negotiation involves complex pricing structures, including volume discounts, volume commitments, payment terms, and possible exclusivity agreements. The artificial intelligence must comprehend the monetary ramifications of various offers and counteroffers. The parties might need to discuss logistics, transportation schedules, and inventory management. The artificial intelligence should be able to respond to inquiries regarding inventory turnover rates, lead times, and potential constraints. Trends in the Market and Competition: Both parties may refer to current market trends,

competitor analysis, and anticipated demand. The AI should be able to incorporate this data into the discourse in order to recommend optimal strategies.

Consumer Behavior and Insights: The retailer may divulge consumer information, preferences, and insights gleaned from their platform. This data should be utilized by the AI to suggest customized product bundles or marketing strategies. Legal and Contractual Considerations: The negotiation requires a discussion of legal issues such as intellectual property rights, warranties, return policies, and adherence to industry regulations. The AI must be able to navigate these complexities of the law.

We can now buy something via a conversation. Searching could change in a similar fashion, as could government services. We used to have to call or visit government offices and do everything via an in-person conversation: now we have the technology to automate that. Shopify has partnered with OpenAI to launch a conversational shopping assistant, and Instacart is working with OpenAI to launch a conversational e-commerce service. South Korean companies Getcha and MyRealTrip have already launched e-commerce services using ChatGPT.

- **Media:** The development of a new content industry may be a threat to the existing industry. More and more people will use AI during their Netflix and YouTube time. Static, fixed content that can’t interact with users will feel outdated. An interactive content industry will be born. A content industry will evolve that is constantly creating as people speak. People will become consumers the mo-

ment they create. This will be the era of the instant consumer. We will likely spend less time on social media. AI will become people's new smart friend. The media industry will be transformed into an interactive one. It is impossible to imagine how many new media will emerge with AI. Language generation AI, represented by ChatGPT, and various image generation AIs will be interconnected. For example, interactive movie services are expected to appear. If the user defines the characters, their relationships, and their initial state, the AI story will be developed as a text, and the text will be automatically made into images such as webtoons and even videos. In the process, the user can intervene, give verbal instructions, and suggest new directions for the development of the situation, and the creation of the story and the video will lead to a repeated structure, forming an ecosystem where users create and enjoy at the same time. If the result is good, they will be able to share it with other users, distribute it, and sell it (Dwivedi et al., 2023).

- **Journalism:** Media such as the press will need to actively use generative and conversational AI for their own purposes, while being alert to the emergence of new media. Conversational AI could change the way journalism is done. Readers won't just consume text, they'll consume conversations with journalists. Future journalists will need to be able to design how their AI avatars will automatically interact with readers and deliver value, and how they will interact with readers secondarily. Even for video news, audiences will want an AI that answers their questions, rather than simply consuming the footage be-

ing delivered. The journalists and media companies that provide solid, reliable content will be the ones that survive.

- **Tourism service:** Conversational travel planning by ChatGPT is now integrated directly into the Expedia app. Members can now fantasize about travel while using the application. *"Expedia is attempting to integrate ChatGPT from OpenAI into its mobile app so that consumers can receive personalized travel advice."* Expedia and Kayak collaborated to develop a plug-in for a robot that enables customized travel planning. Travel applications use AI and machine learning to provide customers with personalized and relevant trip options, price comparisons, and virtual assistants. GPT-4, Bing Chat, provided information about specific travel from the airport a user was departing from and improved it when the user provided the correct departure date. Generative AI could be of great assistance for both travel planning and booking in the near future (Kim, 2023).

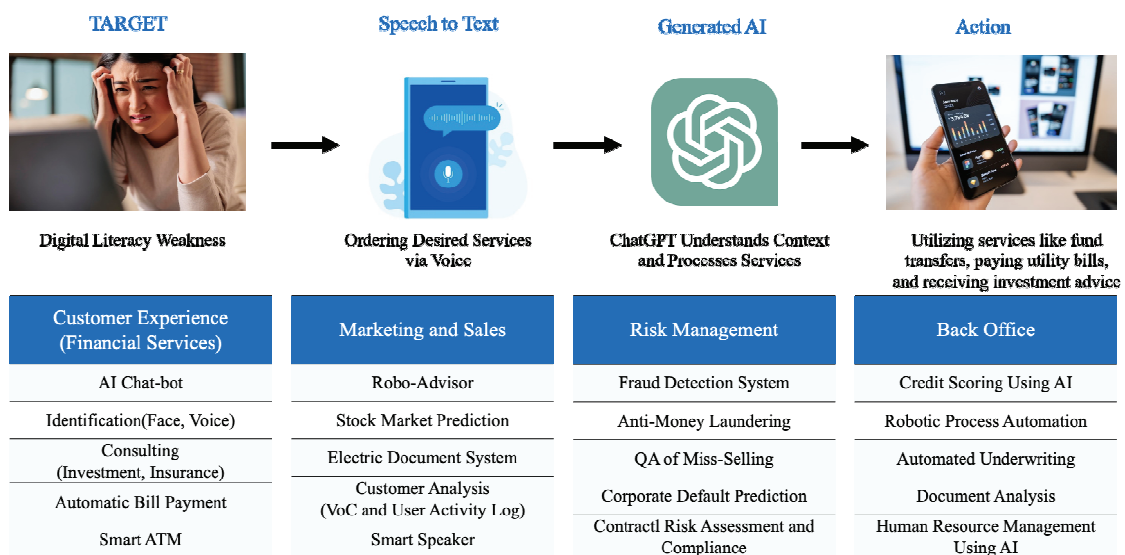
III. Applications in the Financial Sector

The term 'artificial intelligence' implies that machines can act as a substitute for humans, exhibiting human-like behaviors and actions. In other words, AI has the potential to replace human labor in tasks that humans traditionally performed in service-oriented roles. Although AI can substitute for human labor in various tasks in our daily lives, financial services involve a wide range of essential tasks that are indispensable for almost everyone. Fintech and digital finance, which represent the digital trans-

formation in the industry, aim to provide users with convenient and low-cost services. However, this digital shift has proven to be a disaster for senior groups who struggle with digital literacy. The digital transformation, which should have been a blessing to humanity and society due to improved digital literacy, is acting as a new hurdle for some users in certain sectors. Amidst these challenges, AI assistance can provide equal opportunities for vulnerable populations with low digital literacy while also enabling financial institutions to increase efficiency through digital transformation. In this section, we aim to explore the diverse roles AI can play in financial services, focusing on the restructuring of the financial industry in tandem with the rise of fintech companies using AI (see <Figure 1>). We will investigate whether generative AI, such as ChatGPT, can substitute for various functions within these services.

When examining text generated using ChatGPT, one could imagine that a human is hiding behind the computer, as the AI produces content that closely

resembles human writing. The human-like nature of the output is a crucial point to consider. Most people are not accustomed to confidently explaining something they know to be false as if it were true, often opting to give up on providing an answer altogether. However, generative AI like ChatGPT has been reported to be, at times, too human-like, which can be problematic. It is well-known that ChatGPT often makes errors regarding authors or sources in academic papers, leading many researchers to trust Google over ChatGPT for reference management. When comparing financial product recommendations provided by ChatGPT—such as savings products, insurance products, and stock picks—with actual financial institution offerings, AI frequently recommended products that were not yet available. Even when recommending currently available products, its suggested interest rates or terms often did not match reality. Despite this, ChatGPT provides recommendations with great confidence, posing a significant risk for users who blindly trust its output.



<Figure 1> AI in the Financial Sector

One of the biggest drawbacks of machine learning, and ChatGPT in particular, is the risk arising from its reliance on past data for learning. Because ChatGPT has gained trust in various fields due to its outstanding performance, the risk of recommending outdated financial products in financial services must be urgently addressed through reinforcement learning or other means. In addition to the mistakes stemming from ChatGPT's backward-looking learning approach, a common human error is using AI for future decision-making.

The first point that comes to mind is information asymmetry with regard to the future. Humans can never know the future; they can only make the best predictions possible, based on a wealth of surrounding information. However, a common mistake when using AI such as ChatGPT for investment advice is deifying it. The predictions made by AI such as ChatGPT are just that—predictions—not divine determinations of the future (assuming a deity exists that determines human fate). We asked ChatGPT to recommend five stocks for a 28-year-old office worker with a monthly income of 1.7 million KRW wanting to invest approximately 500,000 KRW per month, on April 17, 2023 (<Table 2>). A month

later, we found that three of the five stocks generated profits, while the remaining two incurred losses. This highlights that ChatGPT should be regarded as only a plausible predictive tool for anticipating the future. Neither humans nor AI can know how the rate of return will change in a year. This is because ChatGPT, an AI that thinks and behaves like a human, has become close to being truly human in its predictions.

We conducted a small experiment to test ChatGPT's document-writing abilities, focusing on online review generation. It is often said that online reviews contain many manipulated entries, which can cloud consumers' judgment. We randomly mixed 50 online reviews written by ChatGPT with 50 online reviews written by consumers and asked a 28-year-old consumer to determine whether they were manipulated. The results, as shown in <Table 2>, indicate an accuracy of 52%, demonstrating that the two sources were nearly indistinguishable. Only 51.5% of the predicted original reviews were original. As ChatGPT is a text-based machine learning output, it exhibits exceptional abilities in text mining, including document classification and writing. The characteristics of ChatGPT can be summarized as its errors arising from past data learning, limitations in predict-

<Table 1> Return on Stocks Recommended ChatGPT, 1 Month after the Recommendation

Stock Name	Period	Rate of Return	GPT's Opinion
Samsung Electronics	2023-04-17	0.91%	High Risk High Return
	2023-05-08		
Hyundai Engineering & Construction	2023-04-17	-0.96%	High Risk High Return
	2023-05-08		
Korea Electric Power Corporation	2023-04-17	0.16%	Stable Growth
	2023-05-08		
CJ CheilJedang	2023-04-17	-0.31%	Stable Growth
	2023-05-08		
KB Financial Group	2023-04-17	1.93%	Stable Growth
	2023-05-08		

<Table 2> Manipulated Reviews Detection by Human

		Predicted	
		Non-manipulated	Manipulated
Actual	non-manipulated	34	16
	manipulated	32	18

Note: Accuracy = 52%, Precision = 66.7%, Recall = 51.5%

<Table 3> Frameworks for Trustworthy AI (Deloitte's Trustworthy Framework, 2022)

Dimension of Trustworthy AI	Description
Fair (Impartial)	Assess whether AI systems include internal and external checks to enable equitable application across all participants.
Transparent (Explainable)	Help participants understand how their data can be used and how AI systems make decisions. Algorithms, attributes, and correlations are open to inspection.
Responsible (Accountable)	Put an organizational structure and policies in place that can help clearly determine who is responsible for the output of AI system decisions.
Robust (Reliable)	Confirm that AI systems can learn from humans and other systems and produce consistent and reliable outputs.
Respectful (Privacy)	Respect data privacy and avoid using AI to leverage customer data beyond its intended and stated use. Allow customers to opt in and out of sharing their data.
Safe (Secure)	Protect AI systems from potential risks (including cyber risks) that may cause physical and digital harm.

ing the future, and its outstanding document-writing capabilities.

For ChatGPT to be more actively applied in our daily lives, a crucial prerequisite must be fulfilled. Specifically, it must achieve “trustworthy AI” status, ensuring that we can use it with confidence. We accept expert opinions and proceed with various tasks based on the premise of trust in humans. This trust is not only culturally important but also a significant legal issue. The time when we can fully use ChatGPT will arrive when it meets the criteria for trustworthy AI, as proposed by Deloitte Consulting.

IV. ChatGPT in the Education Sector

The news that ChatGPT could write a college ad-

mission essay in less than 10 minutes (Whitford, 2022) and that it was good enough to pass the MBA exam at Wharton School (Terwiesch, 2023) was enough to shock the academic community. The revelation that ChatGPT can write essays well and creatively, a task previously thought possible only for humans, has led to serious concern that its use would severely challenge the ethics that have long prevailed in academia. However, on the other hand, some see ChatGPT as a revolutionary tool that will advance conventional education and research (AlAfnan et al., 2023; Dwivedi et al., 2023; Halaweh, 2023; Heaven, 2023; Kasneci et al., 2023).

Reflecting these mixed views, the academic community's response to ChatGPT has been heterogeneous. Some academic institutions and educators are advocating for the prohibition of ChatGPT.

The New York education department and Australian educational jurisdictions recently banned ChatGPT across all their public school networks and devices (Neto, 2023; Shiri, 2023). Public schools in Los Angeles and Seattle have also banned ChatGPT due to concerns about plagiarism and cheating (Neto, 2023). The University of Hong Kong and Sciences Po in France also banned their students from using the tool entirely (Crawford et al., 2023). An international school in South Korea made headlines by assigning a score of zero to any student who used ChatGPT on an assignment (Choi et al., 2023). Academic journals have also announced restrictions on ChatGPT. For example, Holden Thorp, editor-in-chief of the Science family of journals, announced that the Science journals would not accept text written by ChatGPT (or any other AI tools), figures, images, or graphics created by such tools. He also clarified that ChatGPT would not be credited as an author (Thorp, 2023). In January 2023, Springer Nature announced a new principle for all journals published by the company, including Nature, that no LLM (Large Language Model) tool will be accepted as a credited author on research papers and that researchers who use LLM tools must acknowledge them in their papers (Springer Nature, 2023).

On the other hand, those who welcome ChatGPT recognize it as a new teaching and learning opportunity and are eager to embrace and use it. For instance, the University of Tasmania and RMIT University in Australia encourage their students to use ChatGPT to learn (Crawford et al., 2023). A professor at the School of Media & Communication at Korea University in South Korea has declared that he will use ChatGPT as a workbook for his class (Park, 2023). Prof. Kyoung Jun Lee of Kyung Hee University, one of the authors, also adopted the 'Open ChatGPT Test' in his classes this semester,

intending to improve students' ability to use AI (Park, 2023). A Wharton School professor of entrepreneurship at the University of Pennsylvania recommends that his students use ChatGPT for academic purposes inside and outside the classroom (Neto, 2023). Some educators have begun discussions to make ChatGPT more secure and effective for students. Educators and instructors at some Canadian universities are interacting with their students in an open discussion about AI-powered tools, discussing their limitations and ways to prevent academic integrity violations such as plagiarism (Shiri, 2023).

In the face of such conflicting opinions, both for and against ChatGPT, we must discuss how we should understand and respond to this double-edged sword. Thus, in this section, we will examine the opportunities and threats that ChatGPT poses to education and academic ethics. Then, we will discuss how we can effectively embrace ChatGPT.

Opportunities: ChatGPT can be a helpful tool for university students who need help with their writing tasks. It does an outstanding job of presenting commonly known facts logically. It can also assist professors and graduate students in completing writing duties such as seminar work, paper writing, and providing student feedback efficiently and effectively. At a syntactic level, it can identify and correct typos with impressive accuracy. While it cannot perform very well at a semantic level, it can still be used to revise potential grammatical inconsistencies (Kasneci et al., 2023). Second, ChatGPT can aid in developing critical thinking and problem-solving skills. It can help students easily comprehend the main ideas and structure their thoughts when writing by generating drafts (Kasneci et al., 2023). It can also enhance research skills by providing valuable information and resources on a particular subject and suggesting unexplored areas and current research

topics for analysis. It is especially beneficial for developing interdisciplinary topics, as it can provide insights into relevant theories or models from various perspectives. With the prompts shown in the example in <Table 4>, researchers in MIS(Management Information Systems) can get an idea of which theories or models might be applicable when approaching

a research topic from a sociology, psychology, or even physics or bioengineering perspective. Third, professors can use ChatGPT to offer customized learning experiences to their students. Such a service could suggest learning resources matching each student's needs and offer tailored feedback. As demonstrated in <Table 4>, with ChatGPT, an instructor

<Table 4> Examples of ChatGPT Prompts for University Education and Research

Category	Task	Sample ChatGPT Prompts
Writing aid tool	Proofreading	From now on, I'm going to give you some texts. Then please proofread them.
	Paraphrasing	From now on, I'm going to give you some texts. Then please paraphrase them.
	Tone conversion	From now on, I'm going to give you some texts. Then please paraphrase them in a scientific research paper style.
Research aid tool (Caulfield and Solis, 2023)	Developing a research question	Develop possible research questions on the following topic: "The factors that affect the use of conversational AI service."
	Exploring interdisciplinary research topics	From a psychological standpoint, develop plausible factors that affect the use of conversational AI services.
	Drafting a research paper	Create an outline for an academic research paper with the following research question: "What are the key reasons for individuals to use conversational AI services, and how do these reasons differ across various demographic groups?" The paper will be about 20 pages long.
	Converting references to a specific format	Convert the following references into APA style: Lewis, W., Agarwal, R., and Sambamurthy, V. "Sources of influence on beliefs about information technology use: an empirical study of knowledge workers," MIS Quarterly, Vol. 27, No. 4, 2003, pp. 657-678.
	Developing a software code for empirical analysis	Write Python code to perform DID (Difference-in-Difference) analysis.
	Writing a cover letter for journal submission	I am going to submit a paper regarding a novel fake news detection model using GPT-4 to Asia Pacific Journal of Information Systems. Please write a cover letter.
	Writing a review report for peer review	Write a review report that recommends rejection because the manuscript does not fit the aim and scope of the journal.
Customized education support tool	Developing questions similar to the specific question	Develop five questions regarding SQL queries similar to the following question and provide the correct answers and explanations: With SQL, how do you select a column named "FirstName" from a table named "Persons"? A. <code>EXTRACT FirstName FROM Persons</code> B. <code>SELECT FirstName FROM Persons</code> C. <code>SELECT Persons.FirstName</code> D. <code>EXTRACT Persons.FirstName</code>
		You're a data scientist. Please answer the questions I'm about to ask.
		What qualifications do I need to have to get that job?
		How much do new hires typically earn?

can easily create and provide questions similar to the ones his or her student got wrong. This personalized assistance effectively reduces the time and effort spent by professors in designing custom-made materials and feedback, enabling them to concentrate on creating interactive and exciting lessons for their students. Fourth, ChatGPT can aid professors by providing resources, summaries, and explanations of new teaching methodologies, technologies, and materials (Kasneci et al., 2023). It can help them to keep up to date with the latest developments and techniques in education, contributing to the effectiveness of their teaching. For instance, ChatGPT is expected to facilitate the adoption of flipped learning in education. As a result, instructors can prioritize completing critical work in class and focus more on multimedia assignments or oral presentations instead of class assignments (Rudolph et al., 2023; Syme, 2023). We can use ChatGPT to enhance the clarity of teaching materials and locate necessary information or resources for professionals learning on the job and for on-the-job training modules that require presentation and communication skills. This approach allows more time to give feedback and revise students' work, as Rudolph et al. (2023) stated. Fifth, ChatGPT has the potential to significantly enhance digital ecosystems for education, particularly those based on Augmented Reality (AR), Virtual Reality (VR), and related digital experiences, as noted by Kasneci et al. (2023). This is because it can amplify several factors crucial for users' immersive interaction with digital content. For instance, its natural conversation feature can significantly improve the communication capabilities of AR/VR education software, facilitating effective interaction between users and the system, such as virtual teachers or peers. Virtualspeech, a leading provider of VR training solutions based in the UK, has successfully implemented

this feature by integrating ChatGPT into its VR-based soft skills training solution. This integration enhances realistic simulations for performance reviews, interviews, difficult conversations, and customer service training (Melnick, 2023).

Threats: ChatGPT can provide many opportunities for higher education, but it also has threats. One major challenge for educators and researchers is the increasing difficulty distinguishing between machine- and human-generated text (Kasneci et al., 2023). Some instructors are concerned that students may use ChatGPT to outsource their written assignments, as it can produce seemingly good prose in seconds without being detected by plagiarism software. Although various methods and tools have been proposed to detect ChatGPT-generated text, including those developed by Cotton et al. (2023), Gu et al. (2022), Kirchenbauer et al. (2023), and Tian (2023), even with these tools, it remains challenging to differentiate between machine-generated and human-generated text (Else, 2023; Perkins, 2023). The second issue with ChatGPT is that its ability to create text closely resembling human writing can make it challenging for students to differentiate between reliable and unverified information. Although ChatGPT's knowledge of current events and the world is limited to before 2021, it can still produce outputs that appear believable but are inaccurate, a phenomenon known as hallucination. Hallucinations can result in students accepting incorrect or misleading information as accurate without questioning its validity. Third, ChatGPT supports multiple languages by default. However, in the case of GPT-3, the parent language model of ChatGPT, English documents were mainly used in its training process (92% of all training documents). In contrast, Korean documents were just 0.015% of the total training documents.¹⁾ This could create an inequitable

advantage for English-speaking users, as they may find using such educational technologies more accessible and effective than non-English-speaking users, potentially resulting in unequal access to these technologies. This inequality may be more of a cultural threat than a linguistic one. Due to the English-biased training data, ChatGPT may be multilingual, but it is monocultural, as Rettberg (2022) argued. The knowledge and information provided by ChatGPT mainly reflect the culture and laws of the US. When applied to educational environments in other countries, it is likely to convey knowledge or information that lies outside the cultural and institutional background. The fourth issue may arise when professors or students become overly reliant on ChatGPT (Kasneci et al., 2023; van Dis et al., 2023). This overreliance could harm their ability to think critically and solve problems. ChatGPT is designed to generate information quickly and easily. It can promote a lack of effort and discourage individuals from conducting their own investigations to arrive at conclusions or solutions. While it can provide relevant information, it is not a substitute for the creative and analytical skills cultivated through human instruction. Furthermore, due to the hallucination problem mentioned above, it is risky to accept the information provided by ChatGPT without verification, as it may provide plausible information that is nonetheless false. Fifth, the application of ChatGPT in education raises concerns regarding data privacy and security, as student data is often confidential and personal. As a result, there are worries about potential data breaches, unauthorized access to student information, and using such data for purposes unrelated to education. For example, a recent

incident involving Samsung Electronics highlights the risks of using ChatGPT, even in non-education contexts. Samsung engineers were using ChatGPT to review source code and accidentally leaked confidential company information, resulting in a breach of data privacy (Mauran, 2023). This incident implies that when using ChatGPT in education, users should be careful not to include sensitive personal information in their conversations.

Suggestions: So far, we have examined the positive possibilities and harmful threats that ChatGPT can bring to the education sector. How should educators and higher education institutions deal with ChatGPT? Fundamentally, much of the risk with ChatGPT stems from the fact that it is imperfect. However, these technical imperfections in ChatGPT can also be leveraged as opportunities for the technology to be used effectively in education (Heaven, 2023). For example, the hallucination effect of ChatGPT can act as a motivator to prevent users from absorbing information generated by ChatGPT out of unawareness. Furthermore, ChatGPT can serve as an excellent teaching and research tool if its technical imperfections encourage its users to criticize and revise incorrect knowledge or information rather than blindly accepting it. From this perspective, we offer the following advice regarding the use of ChatGPT in education. First, we recommend adopting tools or techniques that can minimize the side effects of ChatGPT. Although ChatGPT has only been around for a short time, several techniques and tools have been introduced to prevent inappropriate overuse (Kasneci et al., 2023). For example, Cotton et al. (2023) proposed several approaches for identifying work generated by ChatGPT. Tian (2023) also released a detection tool for AI-generated writing named GPTZero, which leverages perplexity to indicate the generalization capabilities of the language

1) https://github.com/openai/gpt-3/blob/master/dataset_statistics/languages_by_character_count.csv

model used to generate the text. More advanced techniques involve watermarking the output of language models (Gu et al., 2022; Kirchenbauer et al., 2023), such as generating content that biases towards terms less likely to be jointly used by humans in a given passage. Major education software providers, including Turnitin (turnitin.com) and Cadmus (cadmus.io), are also working on AI detection capabilities in their current electronic platforms to detect content created using AI tools (Dwivedi et al., 2023). While these tools can help to protect academic integrity and prevent the misuse of ChatGPT in the short term, it is essential to develop curricula and guidelines that promote the innovative and evidence-based use of ChatGPT over the long term (Kasneci et al., 2023). Second, to ensure the successful use of ChatGPT in educational settings, it is important to provide sufficient training and support to professors and students. While ChatGPT can be a valuable tool for teaching and learning, it may require some technical skill and familiarity (e.g., writing a prompt for a specific purpose). Therefore, offering training sessions that cover the basics of how to use ChatGPT, as well as more advanced features and functionalities, can help individuals effectively integrate the tool into their educational practices. Additionally, ongoing support should be made available to address any questions or concerns that may arise during the implementation process. By providing adequate training and support, professors and students will be better equipped to use ChatGPT to its full potential, resulting in a more engaging and practical learning experience. Third, to ensure the proper use of ChatGPT in universities, we recommend the development of a code of conduct that provides guidelines and ethical considerations. This code of conduct should be developed with the input of various stakeholders, including students, faculty, administrators,

and experts in AI ethics. The code of conduct should cover aspects such as the proper use of ChatGPT for research and academic purposes, the avoidance of plagiarism or academic dishonesty, the protection of student data and privacy, and the responsible use of ChatGPT.

V. A New Era of AI Collaboration

In general, AI can be divided into two categories: narrow AI and general AI (Kaplan and Haenlein, 2019). Narrow AI, also known as weak AI, is designed to execute specific tasks or address specific problems, such as language translation or image recognition. Systems adopting the narrow AI concept excel in their designated domains but lack the adaptability or generalizability to operate in other domains. In contrast, general AI (or strong AI) refers to a form of AI that, like humans, can learn, reason, and apply knowledge across a broad range of tasks and domains (Goertzel, 2014). This form of sophisticated AI is more likely to remain a theoretical concept, as no AI has yet perfectly attained this level of autonomy and adaptability. The existence of ChatGPT demonstrates that strong AI, at least at a limited level, may be on the horizon, and suggests that it's time to start thinking about the integrated use of strong and weak AI to be more efficient and effective.

The synergy between cloud computing and API-based digital services has transformed the digital business landscape into a sophisticated and resilient ecosystem, with a similar evolution anticipated in the AI-driven economy. As AI technology continues to advance, we will see a shift from competition to collaboration among various AI systems more (Smuha, 2021). The Web 2.0 business paradigm, fuelled by the integration of cloud computing and

API-based digital services, also enables AI solutions to complement one another, thereby creating a more efficient and robust AI-driven ecosystem (Lee and Ha, 2018).

The decision by OpenAI to open its service API and enable transfer learning for the development of other AI systems has made it significantly easier to create AIs that excel in specialized domains. This is especially important for companies that have not been able to afford to invest in effectively inferring user intent for natural chat, as it provides an opportunity to develop AI-powered chat services more cheaply and with higher performance. At the same time, we expect to see accelerated research and investment in autonomous learning and connectivity between AIs (Wright and Schultz, 2018). The goal is to ensure that the gains we've made in web services can be reaped in the new AI platform ecosystem. Web services have made it possible to develop autonomous and automated systems that allow machines to send data to each other or invoke functions by sharing necessary metadata (Gottschalk et al., 2002). It's no exaggeration to say that metadata has been the glue that holds them together. Given ChatGPT's capabilities and performance, it's not impossible for AIs to autonomously create the programming code needed to bond with each other through conversation in the future (Mortensen, 2022).

As autonomous decision-making ushers in a new era of artificial intelligence featuring transfer learning, data generation, and autonomous API-driven mash-ups, it is essential to address increasingly complex and sensitive questions (Thiebes et al., 2021). Page et al. (2018) highlighted the AI community's concerns regarding potential risks like malfunctions, malicious attacks, and ethical issues, proposing agent-based simulations as a solution. Brynjolfsson and McAfee (2017) acknowledged AI's potential to significantly

boost business productivity, but also warned of its negative consequences, such as serious issues arising from poor decisions, and job displacement resulting from AI replacing human labor, urging for proactive management and regulatory actions. Paul et al. (2023) emphasized the enhanced consumer experience provided by ChatGPT-powered chatbots, while also noting the privacy risks due to unauthorized collection or sharing of personal information. In summary, addressing emerging challenges such as potential risks, ethical dilemmas, and privacy concerns is vital as AI evolves, necessitating the implementation of proactive management and regulatory strategies to mitigate these issues.

There is an undeniable allure in experimenting with cutting-edge technologies like ChatGPT. Individuals are captivated by the potential of such advancements and may even relish the notion of testing AI to its limits, ultimately demonstrating that it cannot completely surpass the intellectual ability of humans. Most disruptive technologies or ideas fail to translate the initial excitement into tangible business results (Andrew and Sirkin, 2003; Tushman and O'Reilly, 1997). While there have been many AI developments over the years, it's important to note that few have been able to capture the attention of the investors and customers; thus transforming possibilities into tangible results. IBM's Watson, the most advanced AI of the 2010s, was officially declared a failure in 2018 because of its potential to disrupt medical practice (Chen, 2018). If success and failure are defined by the quality of the AI's performance, it is likely that the current ChatGPT will face major challenges in the near future. In addition, it may be difficult to overcome the resistance to innovation if Chat GPT fails to address issues such as privacy violations, incorrect answers, and negative consequences of misuse (Talke and Heidenreich, 2014).

In other words, ChatGPT, like Watson, may be viewed as a technological advancement, but not powerful enough to create business value and transform society.

Amid initial doubts, ChatGPT's real potential might not be in the pursuit of a perfect AI, but rather in cultivating a novel ecosystem of applications powered by AI (Rao, 2021). Individuals, institutions, businesses, and governments alike are recognizing ChatGPT's impact and possibilities. ChatGPT closely resembles a partial strong AI, and efforts are ongoing to develop complementary AIs to expand its capabilities and knowledge. It should be noted that businesses face the crucial decision of not only accepting AI but also adapting to the new age and its evolving rules.

VI. Conclusion

We have noted that the impact of ChatGPT, with other AI technologies and diverse systems, can result

in new business models and services, highlighting the importance of incorporating it into different industries and educational institutions. As a tool for research and education, ChatGPT encourages critical thinking and helps eliminate false information. However, the advancement of AI raises serious concerns regarding privacy, security, law, and ethics, as well as the possibility of AI making decisions independently of human input. The digital transformation has widened the digital divide, particularly for seniors, underdeveloped countries, and local companies. Despite these challenges, individuals, groups, companies, and governments should recognize the potential impact and opportunities that ChatGPT presents.

Credit author statement

All authors contributed equally to this work in terms of conceptualization and writing.

<References>

- [1] AlAfnan, M. A., Dishari, S., Jovic, M., and Lomidze, K. (2023). ChatGPT as an educational tool: Opportunities, challenges, and recommendations for communication, business writing, and composition courses. *Journal of Artificial Intelligence and Technology*, 3(2), 60-68. <https://doi.org/10.37965/jait.2023.0184>.
- [2] Andrew, J., and Sirkin, H. (2003). Innovating for cash. *Harvard Business Review*, 81(9), 76-83.
- [3] Brynjolfsson, E., and McAfee, A. (2017). Artificial intelligence, for real. *Harvard Business Review*, 1, 1-31.
- [4] Caulfield, J., and Solis, T. (2023). Using ChatGPT for Assignments, Tips & Examples. Scribbr. Retrieved from <https://www.scribbr.com/ai-tools/chatgpt-assignments/>
- [5] Chen, A. (2018). IBM's Watson gave unsafe recommendations for treating cancer. Retrieved from <https://www.theverge.com/2018/7/26/17619382/ibms-watson-cancer-ai-healthcare-science>
- [6] Choi, M., Choi, W., and Lee, M. (2023). [Exclusive] International school students in Korea ghostwrite assignments with ChatGPT... 'All scored 0'. Dong-A Ilbo. Retrieved from <https://www.donga.com/news/Society/article/all/20230209/117801590/1>
- [7] Cotton, D. R. E., Cotton, P. A., and Shipway, J. R. (2023). Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. *Innovations in*

- Education and Teaching International*, Forthcoming. <https://doi.org/10.1080/14703297.2023.2190148>.
- [8] Crawford, J., Cowling, M., and Allen, K. A. (2023). Leadership is needed for ethical ChatGPT: Character, assessment, and learning using artificial intelligence (AI). *Journal of University Teaching & Learning Practice*, 20(3).
- [9] Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., Baabdullah, A. M., Koohang, A., Raghavan, V., Ahuja, M., Albanna, H., Albashrawi, M. A., Al-Busaidi, A. S., Balakrishnan, J., Barlette, Y., Basu, S., Bose, I., Brooks, L., Buhalis, D., Carter, L., Chowdhury, S., Crick, T., Cunningham, S. W., Davies, G. H., Davison, R. M., Dé, R., Dennehy, D., Duan, Y., Dubey, R., Dwivedi, R., Edwards, J. S., Flavián, C., Gauld, R., Grover, V., Hu, M. C., Janssen, M., Jones, P., Junglas, I., Khorana, S., Kraus, S., Larsen, K. R., Latreille, P., Laumer, S., Malik, F. T., Mardani, A., Mariani, M., Mithas, S., Mogaji, E., Nord, J. H., O'Connor, S., Okumus, F., Pagani, M., Pandey, N., Papagiannidis, S., Pappas, I. O., Pathak, N., Pries-Heje, J., Raman, R., Rana, N. P., Rehm, S. V., Ribeiro-Navarrete, S., Richter, A., Rowe, F., Sarker, S., Stahl, B. C., Tiwari, M. K., van der Aalst, W. M. P., Venkatesh, V., Viglia, G., Wade, M., Walton, P., Wirtz, J., and Wright, R. (2023). "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy. *International Journal of Information Management*, 71, 102642.
- [10] Else, H. (2023). Abstracts written by ChatGPT fool scientists. *Nature*, 613(7944), 423-423.
- [11] Goertzel, T. (2014). The path to more general artificial intelligence. *Journal of Experimental & Theoretical Artificial Intelligence*, 26(3), 343-354.
- [12] Gottschalk, K., Graham, S., Kreger, H., and Snell, J. (2002). Introduction to Web services architecture. *IBM Systems Journal*, 41(2), 170-177.
- [13] Gu, C., Huang, C., Zheng, X., Chang, K. W., and Hsieh, C.-J. (2022). Watermarking pretrained language models with backdooring. *arXiv preprint arXiv:2210.07543*.
- [14] Halaweh, M. (2023). ChatGPT in education: Strategies for responsible implementation. *Contemporary Educational Technology*, 15(2), ep421.
- [15] Heaven, W. D. (2023). ChatGPT is going to change education, not destroy it. *MIT Technology Review*. Retrieved from <https://www.technologyreview.com/2023/04/06/1071059/chatgpt-change-not-destroy-education-openai/>
- [16] Kaplan, A., and Haenlein, M. (2019). Siri, Siri, in my hand: Who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence. *Business Horizons*, 62(1), 15-25.
- [17] Kasneci, E., Seßler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günnemann, S., Hüllermeier, E., Krusche, S., Kutyniok, G., Michaeli, T., Nerdel, C., Pfeffer, J., Poquet, O., Sailer, M., Schmidt, A., Seidel, T., Stadler, M., Weller, J., Kuhn, J., and Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences*, 103, 102274.
- [18] Kim, J. H., Cho, H. D., Kang, S., and Koo, C. (2023). TechTalk Interview about ChatGPT in Smart Tourism with Dr. Buhalis, Dr. Cobanoglu, Dr. Ivanov, Dr. Khoo, Dr. Law, Dr. Pan, and Dr. Rao. *Journal of Smart Tourism*, 3(1), 1-8. <https://doi.org/10.52255/SMARTTOURISM.2023.3.1.1>
- [19] Kim, T. (2023). Over the rainbow: How to fly over with ChatGPT in tourism. *Journal of Smart Tourism*, 3(1), 41-47. <https://doi.org/10.52255/SMARTTOURISM.2023.3.1.5>
- [20] Kirchenbauer, J., Geiping, J., Wen, Y., Katz, J., Miers, I., and Goldstein, T. (2023). A watermark for large language models. *arXiv preprint arXiv:2301.10226v1*.
- [21] Kookmin Press (2023). [Editorial] How to Ride the Wave of ChatGPT. Retrieved from <https://press.kookmin.ac.kr/news/articleView.html?idxno=102864>

- [22] Lee, K., and Ha, N. (2018). AI platform to accelerate API economy and ecosystem. In *2018 International Conference on Information Networking (ICOIN)* (pp. 848-852).
- [23] Mauran, C. (2023). Samsung bans ChatGPT, AI chatbots after data leak blunder. Retrieved from <https://mashable.com/article/samsung-chatgpt-leak-leads-to-employee-ban>
- [24] Melnick, K. (2023). How ChatGPT is being used to enhance VR training. VRScout, February 22, 2023. Retrieved from <https://vrscout.com/news/how-chatgpt-is-being-used-to-enhance-vr-training/>
- [25] Milmo, D. (2023). ChatGPT reaches 100 million users two months after launch. Retrieved from <https://www.theguardian.com/technology/2023/feb/02/chatgpt-100-million-users-open-ai-fastest-growing-app>
- [26] Mortensen, J. (2022). Can an AI create another AI? Retrieved from <https://techevaluate.com/can-an-ai-create-another-ai>.
- [27] Neto, J. A. R. (2023). The impact of ChatGPT on education. Medium.com. Retrieved from <https://medium.com/chatgpt-learning-asia/the-impact-of-chatgpt-on-education-739b7479713c>
- [28] Page, J., Bain, M., and Mukhlis, F. (2018). The risks of low level narrow artificial intelligence. In *2018 IEEE International Conference on Intelligence and Safety for Robotics (ISR)* (pp. 1-6).
- [29] Paul, J., Ueno, A., and Dennis, C. (2023). ChatGPT and consumers: Benefits, pitfalls and future research agenda. *International Journal of Consumer Studies*, 47(4), 1213-1225. <https://doi.org/10.1111/ijcs.12928>
- [30] Perkins, M. (2023). Academic integrity considerations of AI Large Language Models in the post-pandemic era: ChatGPT and beyond. *Journal of University Teaching & Learning Practice*, 20(2), 07.
- [31] Rao, D. (2021). GPT-3: We're at the very beginning of a new app ecosystem. Retrieved from <https://venturebeat.com/ai/gpt-3-were-at-the-very-beginning-of-a-new-app-ecosystem>
- [32] Rettberg, J. W. (2022). ChatGPT is multilingual but monocultural, and it's learning your values. Retrieved from <https://jilltxt.net/right-now-chatgpt-is-multilingual-but-monocultural-but-its-learning-your-values/>
- [33] Rudolph, J., Tan, S., and Tan, S. (2023). ChatGPT: Bullshit spewer or the end of traditional assessments in higher education? *Journal of Applied Learning and Teaching*, 6(1). <https://doi.org/10.37074/jalt.2023.6.1.9>.
- [34] Shiri, A. (2023). ChatGPT and academic integrity. Information Matters. Retrieved from <https://informationmatters.org/2023/02/chatgpt-and-academic-integrity/>
- [35] Smuha, N. A. (2021). From a 'race to AI' to a 'race to AI regulation': regulatory competition for artificial intelligence. *Law, Innovation and Technology*, 13(1), 57-84.
- [36] Song, M. T. (2023). Generative AI Era and AI Trends in the Financial Sector, Koscom Report. Retrieved from <https://newsroom.koscom.co.kr/33754>
- [37] Springer Nature (2023). Tools such as ChatGPT threaten transparent science; here are our ground rules for their use. *Nature*, 613(7945), 612. <https://doi.org/10.1038/d41586-023-00191-1>.
- [38] Syme, P. (2023). A top UK private school is changing its approach to homework amid the rise of ChatGPT, as educators around the world adapt to AI. Business Insider, January 31, 2023. Retrieved from <https://www.businessinsider.com/chatgpt-helps-move-top-uk-private-school-to-ditch-homework-2023-1>
- [39] Talke, K., and Heidenreich, S. (2014). How to overcome pro change bias: incorporating passive and active innovation resistance in innovation decision models. *Journal of Product Innovation Management*, 31(5), 894-907.
- [40] Terwiesch, C. (2023). Would chat GPT3 get a Wharton MBA? A prediction based on its performance in the operations management course. Mack Institute for Innovation Management at the Wharton School, University of Pennsylvania. Retrieved from <https://mackinstitute.wharton.upenn.edu/wp-content/uploads/2023/01/Christian->

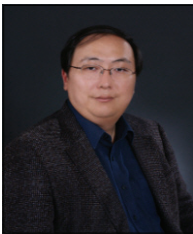
- Terwiesch-Chat-GTP-1.24.pdf
- [41] Thiebes, S., Lins, S., and Sunyaev, A. (2021). Trustworthy artificial intelligence. *Electronic Markets*, 31, 447-464.
- [42] Tian, E. (2023). GPTZero. Retrieved from <https://gptzero.me/>
- [43] Tushman, M. L., and O'Reilly, C. A. III. (1997). *Winning Through Innovation: A Practice Guide to Leading Organizational Change and Renewal*. Harvard Business School Press, Boston.
- [44] van Dis, E. A., Bollen, J., Zuidema, W., van Rooij, R., and Bockting, C. L. (2023). ChatGPT: five priorities for research. *Nature*, 614(7947), 224-226.
- [45] Whitford, E. (2022). A Computer Can Now Write Your College Essay, Maybe Better Than You Can. *Forbes.com*, December 9, 2022. Retrieved from <https://www.forbes.com/sites/emmawhitford/2022/12/09/a-computer-can-now-write-your-college-essay---maybe-better-than-you-can/>
- [46] Wong Nai Seng. (2022). Trustworthy Use of Artificial Intelligence in Finance: Regulatory Perspectives from Asia Pacific. *Deloitte Asia Pacific Centre for Regulatory Strategy*, 6, Retrieved from <https://www2.deloitte.com/jp/en/pages/financial-services/articles/bk/trustworthy-use-ai-finance-regulatory-perspectives-asia-pacific.html>
- [47] Wright, S. A., and Schultz, A. E. (2018). The rising tide of artificial intelligence and business automation: Developing an ethical framework. *Business Horizons*, 61(6), 823-832.

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