International Business & Economics Studies
ISSN 2640-9852 (Print) ISSN 2640-9860 (Online)
Vol. 6, No. 5, 2024
www.scholink.org/ojs/index.php/ibes

Original Paper

Economic Impacts of Generative Artificial Intelligence: A Comprehensive Review of the Literature

Huaize Zhang[1&2*]

[1] Woosong University, Daejeon, South Korea

[2] North Anhui Health Vocational College, Suzhou, China

[*] Corresponding Author, Woosong University, Daejeon, South Korea, Email: zhz@live.wsu.ac.kr

Funding Project

2021 Key Project of Provincial Quality Engineering in Higher Education Institutions of Anhui Province, Research on Teaching Reform of "Access Database" Course in Medical Colleges; Project Number: 2021jyxm1582

Received: August 06, 2024 Accepted: August 26, 2024 Online Published: September 18, 2024

doi:10.22158/ibes.v6n5p69 URL: http://dx.doi.org/10.22158/ibes.v6n5p69

Abstract

Generative Artificial Intelligence (GAI) has emerged as a pivotal force in the Industrial Revolution – 4.0, significantly enhancing productivity and innovation across diverse sectors. This literature review investigates the economic impact of GAI from both macro and micro perspectives, focusing on its influence on productivity, creativity, and technological advancement in various industries. Through bibliometric analysis from the Web of Science database, this study identifies key trends, geographic distribution, and research hotspots in this field. Content analysis finds that GAI technologies substantially boost efficiency and economic output while posing challenges related to ethical considerations and societal risks. This review attempts to bridge the research gap by providing a systematic review and induction of influencing factors in this field and highlights the transformative potential of GAI. Future research directions are proposed to address gaps in understanding the comprehensive economic impact of GAI, aiming to guide enterprises in leveraging these technologies for competitive advantage.

Keywords

generative AI, ChatGPT, economic impact, productivity, creativity, efficiency, innovation

1. Introduction

AI research, escalating since the 1940s, took a definitive turn at the 1956 Dartmouth Conference, spearheaded by John McCarthy (McCarthy et al., 2006). This marked the inception of AI as a field. The advent of Google Translate in 2006 signaled industry leadership in AI's evolution, expanding from academic circles to enterprise and individual applications (Groves & Mundt, 2015). In 2016, the AI program AlphaGo, developed by British agency DeepMind, defeated Go world champion Lee Sedol, igniting worldwide enthusiasm for AI innovation and entrepreneurship (C.-S. Lee et al., 2016). Since then, AI has evolved from software to AI chips and software-hardware integration, entering an era of virtual and real integration and diversity. By 2022, with the popularization of ChatGPT, AI has entered the 4.0 era (Javaid et al., 2023).

The evolution of generative AI and Large Language Models (LLM) has promoted a new wave of AI innovation. Generative AI, which produces original content across text, audio, and video, has become a focal point of discussion (Aydın & Karaarslan, 2023). The debut of OpenAI's "Chat Generative Pre-Trained Transformer" in late 2022 captured global attention, with "ChatGPT" searches surging on Google. ChatGPT belongs to a class of language models called Generative Pretrained Transformer (GPT), relies on deep learning and vast data sets to generate human-like interactions (Cascella et al., 2023). ChatGPT's design, optimized for conversation, leverages generative AI to emulate human responses, create music and images, and synthesize data for analysis (Dasborough, 2023). Remarkably, ChatGPT has passed the Turing test, leading people to mistake its AI-generated responses for those of human (Gattupalli et al., 2023). The emergence of such advanced AI heralds transformative changes in societal functions, including our work, learning, and communication practices.

Generative AI technology, as part of the Fourth Industrial Revolution, create new labor to improve productivity and have a broad impact on economic growth (Acemoglu & Restrepo, 2017). Generative AI represented by ChatGPT, as a subset of AI, can enhance productivity, increase employment and wages, improve production efficiency of enterprises (Noy & Zhang, 2023; Lim & Siripipatthanakul, 2023). The global market size of generative AI reached $43.87 billion in 2023, and is expected to grow from $67.18 billion in 2024 to $967.65 billion in 2032, demonstrating a compound annual growth rate of 39.6% (Market Research Report, 2024). Far exceeding the average annual growth rate of 2% in traditional manufacturing in the United States (Thomas, 2022).

Enterprises that take positive measures will be at a considerable advantage (Ooi et al., 2023). Therefore, enterprises of different scales in various industries are increasing their investment in artificial intelligence to gain competitive advantages (Almada, 2022). In the micro aspect, generative artificial intelligence has also had economic impacts in various industries. Noy and Zhang (2023) using experimental data of mid-level professional writing tasks found that workers who used ChatGPT reduced production time by 0.8 SDs and output quality rises by 0.4 SDs compared to none users. McKinsey and Company (2022) using data from representative sample of the US firms report that AI adopters' firms experienced on average 67 increase in revenues and 79 percent decrease in production

costs compared to none-adopters. However, generative AI is a double-edged sword. Some scholars are concerned about OpenAI's ChatGPT potentially displacing human roles, have negative impact of AI on the economy, morality, ethics, and privacy. Generative AI also can destroy jobs. For instance, Ooi et al. (2023) report that industries with high AI exposure have experienced a 3 percent decline in employment. Bigman et al. (2021) argue that AI could create a great deal of wealth but could also increase economic inequality.

Given the significant attention and multiple impacts of ChatGPT, it is essential to investigate the effects and practical implications of generative AI across various fields (Baber et al., 2023). Scholars have conducted numerous literature reviews to understand the impact, opportunities, and challenges of generative AI. By conducting the keywords related to "generative AI" and "economics" on the Web of Science, we obtained 489 results from All Databases, including some review articles. Wang et al. (2022) explores ChatGPT and other AI technologies for Science (AI4S), which is crucial for national competitiveness and socio-economic growth. Mondal et al. (2023) explore the societal and economic impacts of GAI, urging businesses to adapt to hybrid experiences, envisioning creating value propositions, and improving customer experiences, advocating for its integration into business management for enhanced efficiency. Budhwar et al. (2023) advocates for an expanded HRM research agenda to navigate the evolving landscape of generative AI. Dempere et al. (2023) delves into the impact of ChatGPT on Higher Education Institutions (HEIs), such as economic impacts like job displacement, the digital literacy gap, and AI-induced anxiety, urges balanced regulation in HEI settings, advocating for proactive and ethical use of AI tools. Zota et al. (2023) explores the shift from linear methods to circular methods due to the promotion of resource costs by AI, aiming at constructing an effective chatbot dedicated to the circular economy. Gallifant et al. (2024) provides a comprehensive review of GPT-4 in high-risk contexts like healthcare, which suggest enhancing data transparency, establishing confidence standards, and fostering diverse global involvement for broader societal benefits. Lee et al. (2023) review adopting technology adoption theory, examines chatbot research trends an, intellectual structure, identifying future research directions.

These literature reviews focus on healthcare, education, chemistry, agriculture, human resource management, and other areas. There are more exploratory articles than deterministic research articles, indicating that the field is still in its early stages with many research gaps (Abdirad & Krishnan, 2020). There is not much research on the impact of GAI on the economy, and there are no articles that structure the economic impact of GAI. There is a lack of systematic reviews on the impact of generative artificial intelligence on the economy. In view of this, we propose three research objectives. Firstly, the degree of impact of generative AI on various research fields. Secondly, what are the main influencing factors of generative artificial intelligence on the economy. Finally, what are the gaps in research areas and the directions for future research. We aim to provide a thorough examination of the economic impact of GAI, utilizing bibliometric analysis to foster a holistic understanding of GAI's effects across industries, empowering businesses to maintain a proactive stance in the AI era.

Before starting the second part, three research questions connect with GAI were raised:

Q1: From a macro perspective, which areas have been affected by GAI?

Q2: From a micro perspective, which factors have received more attention in research?

Q3: How can enterprises utilize GAI to gain more economic benefits in future development?

The second part of this article details the methodology, encompassing research design, bibliometric analysis, content evaluation, and data illustration. The third part introduces the results obtained through bibliometrics and content analysis, pointing out the current research trends and key factors. In the fourth and fifth part, we provide the concluding comments and proposed the direction of future investigation.

2. Method

The significant economic impacts of GAI on industries, enterprises, and employees, included those related to politics, law, regional policies, and labor markets. This study examines the direct impact of GAI on the economy. The literature review process follows four steps using the PRISMA method: data collection, bibliometric analysis, content analysis, and interpretation (Zupic & Čater, 2015). We utilized R Studio and VOSviewer software to conduct a bibliometric analysis of data from the Web of Science.

2.1 Data Collection

The first and most important step in the data collection process is literature search. The data collected from the Web of Science (WOS), which employs advanced syntax to search for keywords and thoroughly collect articles related to the target topic. The WOS databases were chosen for this study due to its extensive collection of high-quality articles. As the most trusted and independent global citation database, WOS effectively filters out predatory journals. It is sufficient for our goal of studying the hot topics in this field and identifying the most representative articles.

The search scope was set to “topic,” which includes the title, abstract, and author keywords of the paper. Boolean operators, such as AND and OR, were used to refine the search results. To collect relevant papers and publications related to the Generative AI field, a series of keywords were used, including “generative Artificial Intelligence”, "generative AI”, "conversational agent", “ChatGPT,” “Large Language Model,” and “chatbot.” As outlined in the introduction section, this study aims to understand the GAI impact factors on economy. Therefore, the related keywords such as "economic”, "economy”, “economical” were combined with the GAI keywords to conduct more targeted research on economy. As of July 8st, 2024, the preliminary search yielded a total of 817 articles. To ensure quality, 608 papers that were not in the Web of Science Core Collection were excluded. From the remaining 209, we specifically chose 167 English-language publications dated from 2022 to 2024 for analysis. Due to the need for empirical research data, we excluded 19 articles by types, such as review articles, editorial materials, letters, etc., and 148 articles were included. Then, 20 articles were excluded belong to the Open access Journals / Potential Predatory Journals. Finally, a total of 128 records were selected for analysis (seen Figure 1).

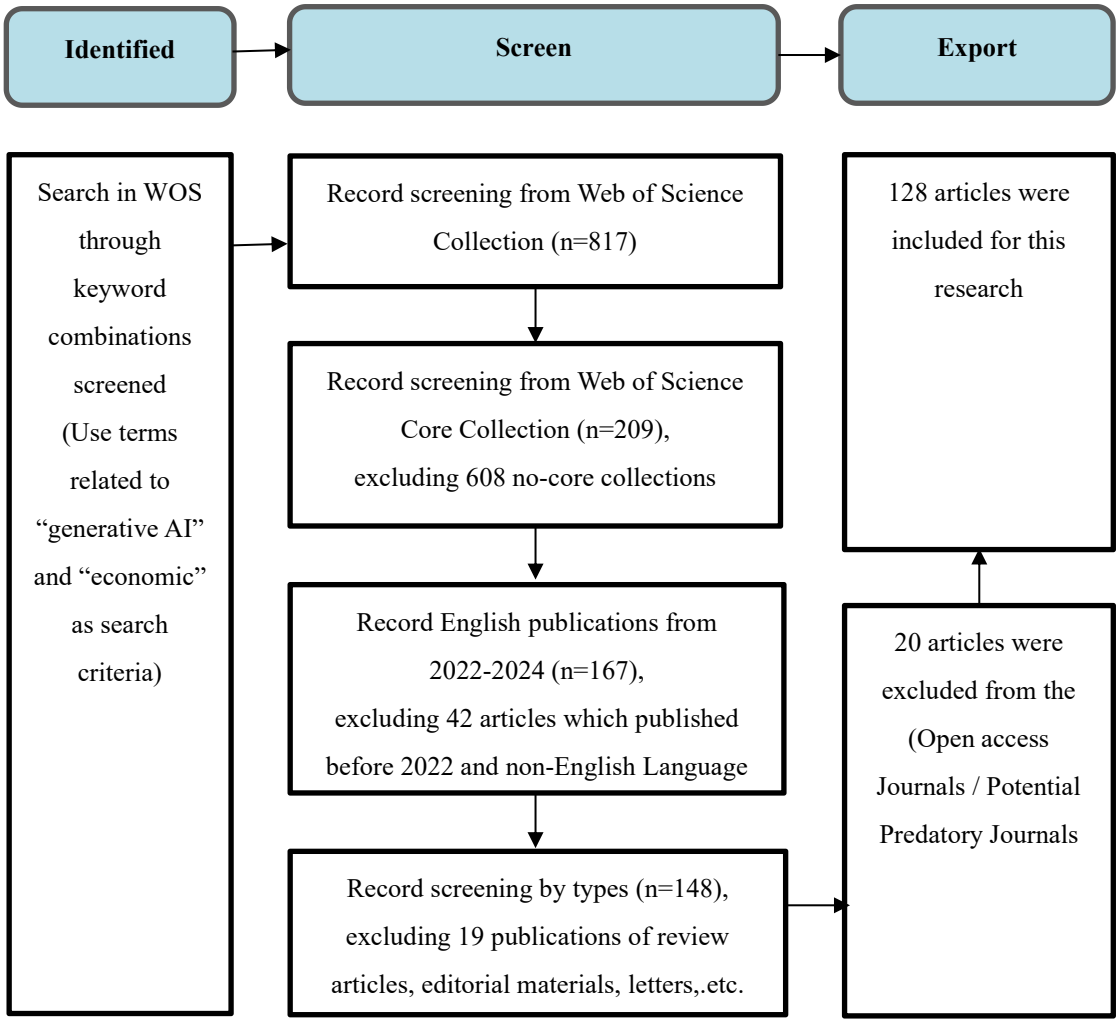

Figure 1. Data Selection Process

2.2 Bibliometric Analysis

The uploaded information was processed to ensure quality and usability. The data in .txt and .xls formats obtained from WOS were exported for analysis using VOSviewer, RStudio, and Excel software. Bibliometric analysis was conducted to systematically study these academic literatures, focusing on keyword frequency, geographic distribution, citations, and references within the articles to identify research trends and connections.

2.3 Content Analysis

Following the bibliometric analysis, the most relevant and highly cited articles were selected for content analysis. This process involved a thorough review of the articles' content to identify the most critical topics. As the focus of this study was to explore how GAI can improve the economic benefits, articles related to performance and income were examined to comprehensively understand the multifaceted impact of GAI on industries and enterprise operations. This helped identify the most

critical influencing factors. In-depth content analysis was conducted to evaluate the impact of GAI on productivity, efficiency, and innovation, thereby promoting corporate performance.

2.4 Interpretation

The results were described based on the research questions, and key findings and trends were presented. For example, research found that a significant amount of literature emphasized the importance of AI in improving employee productivity. By introducing artificial intelligence technology, enterprises and organizations can enhance employee efficiency and work quality, achieving higher levels of productivity and benefits. Additionally, some literature highlighted the role of AI in current trends and future research directions, indicating that AI has not only had a significant impact on various industries currently but will continue to play an important role in the future, driving innovation and development. Descriptive analysis can provide other scholars and enterprises with more concise and clear insights, deepening their understanding of the impact and application of artificial intelligence in different industries and providing useful guidance for future research and practice.

3. Result

By systematically screening literature and analyzing data, this section aims to provide a comprehensive description and valuable insights into the current research status of GAI.

3.1 Bibliometric Analysis

Bibliometric analysis was conducted using R Studio, VOSviewer, and Excel software, focusing on keyword frequency, geographic distribution, citations, and references within the articles to determine research trends and connections.

3.1.1 Main Information

The main data were collected from the research on the influencing factors of “Generative Artificial Intelligence” and “economics” between 2022 and 2024 (seen in Figure 2). This study utilized 125 data sources, and the total number of selected papers was 128. The Annual Growth Rate was 214.25%, indicating a significant increase in studies on this topic. Out of the 128 papers, there are only 31 independent authors, while the total number of authors is 436, with an average of 3.47 co-authors per paper. This suggests extensive collaboration among scholars studying the GAI topic. The proportion of international co-authors is 27.34%, indicating that GAI research has become an international endeavor, with authors from different countries collaborating. A total of 549 author's keywords were used, indicating a detailed search for valuable information. The total number of references cited in the 128 articles is 7,538, demonstrating extensive data collection. The Document Average Age is 0.445 years, suggesting that this study mainly collected papers from the past year and used the latest information.

Figure 2. Data Selection Process

3.1.2 Field Categories

Table 1 presents a distribution of 128 publications related to Generative AI across various scientific fields from the Web of Science database. The fields are ranked by the number of records, with Computer Science leading with 37 papers (28.9%), followed by Business with 17 papers (13.3%). Other prominent fields include Engineering, Interdisciplinary Applications, Artificial Intelligence and etc.all. Since the Web of Science often categorizes the same article into multiple disciplines, these 128 articles are categorized into 319 disciplines, illustrating the multi-disciplinary nature of this topic.

Table 1. Field Categories of 128 Publications

Web of Science Categories	Record Count	% of 128
Computer Science	37	28.9
Business	17	13.3
Economics	16	12.5
Engineering	16	12.5
Interdisciplinary Applications	14	10.9
Artificial Intelligence	13	10.2
Management	12	9.4
Information Systems	11	8.6
Education & Educational Research	9	7.0
Software Engineering	8	6.3

3.1.3 Co-Occurrence Based on Country Classification and Citations

Figure 3 illustrates the Corresponding Author's Countries through a co-occurrence map, providing a visual representation of the geographical spread of the 128 articles. The ratio of Single country

publications (SCP) to Multiple country publications (MCP) indicated that scholars from most countries have engaged in cross-border cooperation.

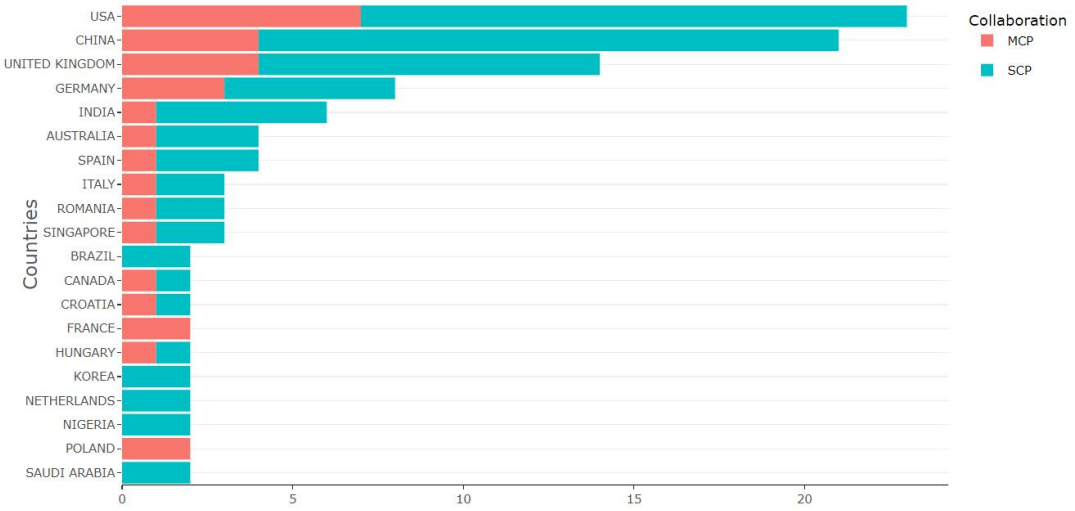

Figure 3. Corresponding Author's Countries of Origin and Publication Type

Table 2 complements this information by offering a detailed list of countries with the most articles and citations, emphasizing the significant connections in global research and highlighting international cooperation within this field. It presents data on the countries with the highest number of references and total citations, which include the USA, China, United Kingdom, Germany, India, Australia, Spain, Italy, Romania and Singapore. This systematic listing identifies the nations that have made substantial contributions to the study of the economic impact of GAI. The United States emerges as the global leader in GAI research, closely followed by China and UK, where researchers have conducted extensive studies. This finding suggests that publications by these countries significantly influence this field and play a pivotal role in shaping global research on GAI. This indicates that publications by these countries significantly influence this field and play a pivotal role in shaping global research on GAI. Future research focus can be placed on these countries, for the quickly respond on GAI and provide more policy support. In deep experiment research, data collection can be considered in these countries, as the quantity and quality of the samples can be guaranteed.

Table 2. Countries of Most Articles and Citations

Country	Articles	Total Citations	Average Article Citations
USA	23	55	2.39
China	21	34	1.62
United Kingdom	14	9	0.64
Germany	8	7	0.88

India	6	3	0.50
Australia	4	0	0.00
Spain	4	0	0.00
Italy	3	2	0.67
Romania	3	1	0.33
Singapore	3	5	1.67

3.1.4 Most Relevant and Cited Authors

Table 3 shows the most relevant authors and articles fractionalized, while Table 4 presents most global cited documents. These papers were sorted in descending order of relevance and citation count. Author Wang, FY published 3 articles with a fractionalized score of 0.78, ranking first. Another important parameter to consider is the number of citations. Wach et al. (2023) and Dogru et al. (2023) have been cited locally more than 30 times by other scholars, indicating that their research has had a significant impact, attracting attention and discussion from researchers.

Table 3. Most Relevant Authors

Authors	Articles	Articles Fractionalized
Wang, FY	3	0.78
Barrios, N	2	0.25
Kshetri, N	2	2.00
Marquez, R	2	0.25
Vera, RE	2	0.25
Wang, X	2	0.40
Zambrano, F	2	0.25
Abavisani, M	1	0.25
Abbott, J	1	0.03
Abdollahi, H	1	0.33

Table 4. Most Global Cited Documents

Articles	TC
Wach (2023)	45
Dogru (2023)	30
Abulibdeh (2024)	13
Mannuru (2023)	8
Marquez (2023)	6
Korinek (2023)	5

Yang (2023)	5
Ai (2024)	5
Jungherr (2023)	5
Kim (2023)	4

3.1.5 Co-Occurrence Map Based on Author's Keywords

We used VOSviewer to analyze the relationships between author's keywords in 128 selected publications. By setting a minimum threshold of two occurrences as the screening criterion, we extracted 35 keywords from a total of 549. Then, we established a co-occurrence network for these author's keywords. As shown in Figure 4, keywords with the largest circle area, such as artificial intelligence and ChatGPT, are the most prominent and associated with almost all other terms. These connections highlight the hot topics in the field, helping identify specific research areas for future study.

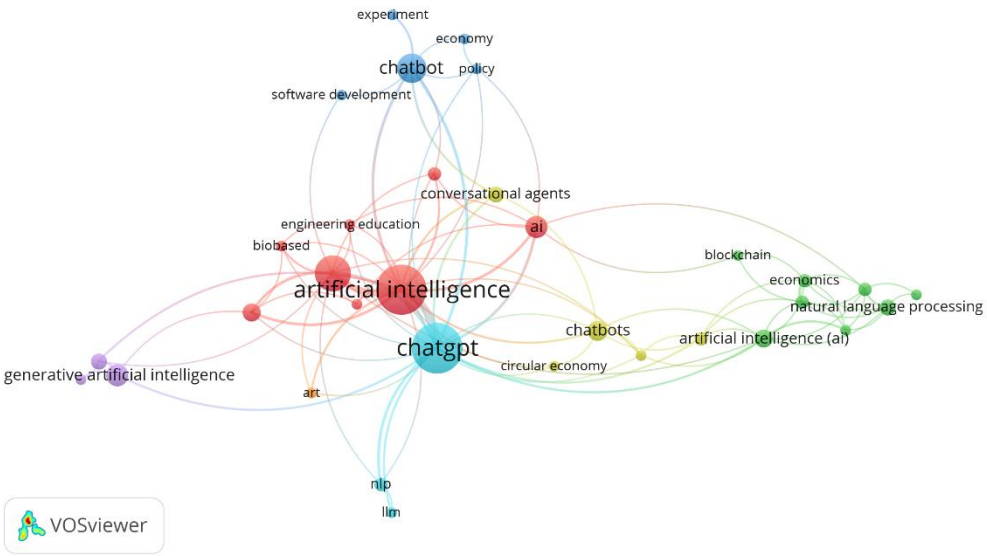

Figure 4. Co-Occurrence Map Based on Author's Keywords

The text extraction process aims to identify popular research vocabulary. Due to variations in keyword expressions, synonyms, and abbreviations by different authors, and limitations in software analysis, there may be some deviation in keyword frequency statistics. We used Excel to organize and merge synonyms and reduce keyword classification. The pivot table identified 28 keywords with a frequency exceeding three occurrences. Among these 28 author's keywords, many keywords are theme-word. So, we excluded 11 keywords used for search, such as "generative AI", "chatGPT", "chatbot", "machine learning", and "economy". The remaining 17 keywords are significant for our research. Table 5 presents the keyword frequency statistics, aiding in understanding the research emphasis of these articles. The keywords in the table indicate that research on generative AI (GAI) and the economy is

concentrated in healthcare, education, biology, marketing, and the circular economy. Future research in these fields will benefit from ample references and a solid theoretical basis. Notably, keywords such as policy, technology, knowledge, innovation, and productivity are frequently mentioned by scholars. These variables should be considered as influencing factors in future analyses of GAI and economics.

Table 5. Frequency of Author's Keywords

Author Keywords	2022	2023	2024	Total
healthcare		2	11	13
technology		4	3	7
education		2	5	7
policy		3	3	6
higher education			6	6
knowledge	1	1	4	6
biology		1	4	5
innovation		3	1	4
blockchain			4	4
market	1	1	2	4
climate change		1	3	4
creativity		1	2	3
art		2	1	3
engineering	1	1	1	3
big data			3	3
circular economy	1	1	1	3
mental health		2	1	3

3.2 Content Analysis

Following the bibliometric analysis, we selected articles that were most relevant to the topic and had a high citation rate for content analysis. This session tries to identify the most critical influencing factors from the data and emphasizes the actual economic impact of GAI on various sectors. According to the Field Categories of these 128 articles from the WOS, as shown in Table 6 and Table 7, we focus on examining articles related to economics, including economics, business, management, and computer science. Some articles were further excluded due to the theme of the article are far from what we expected (Ben et al., 2023). The integration of AI across various domains, including politics, the economy, law, morality, healthcare, and education, highlights its broad applicability and transformative potential. This includes benefits like automation, increased efficiency, improved education, labor reallocation, better consumer service, and informed policymaking. After eliminating irrelevant subjects,

we classified articles for in-depth content analysis from both macro and micro perspectives.

3.2.1 Macro Perspective

AI's widespread integration across sectors, including politics, the economy, law, morality, healthcare, education, labor markets, and logistics, signifies its extensive application and influence. Multiple authors examine the macro impact of generative AI across multiple domains, ranging from economics and politics to law, education, healthcare, and environmental concerns. They address topics like job displacement, biases in policy recommendations, the evolution of education and healthcare systems, challenges within mental health and legal frameworks, as well as the incorporation of AI into circular economy and renewable energy initiatives. The potential for growth is highlighted, as well as the imperative for ethical considerations and regulatory adjustments (Ai et al., 2024; Arai, 2024; Barahona & Almulhim, 2024; Chesterman, 2024; Estrada et al., 2023; Guo et al., 2023; Heo et al., 2024; Iazdi, 2023; Lukauskas et al., 2023; Mannuru et al., 2023; Nay et al., 2024; Salas-Velasco, 2023; Simshaw, 2023; Ulrich et al., 2024; Wach et al., 2023). Table 6 lists highly-cited or highly-quality papers analyzing generative AI from a macro perspective.

Table 6. Generative AI Impact from a Macro Perspective

Authors	Themes	Focus
Abulibdeh et al. (2024)	ethical, partnership, higher education, productivity, sustainability,	Industry 4.0 heralds a transformative era with advanced technologies promising productivity and sustainability. Higher education institutions face the challenge of equipping students with digital skills. This paper explores AI integration in education, focusing on ChatGPT, emphasizing ethical considerations, continuous learning, and industry partnerships.
Barahona, Almulhim, (2024)	circular economy (CE) and renewable energies (REs)	This study examines the integration of circular economy (CE) and renewable energies (REs) over 23 years (2011-2023), analyzing 751 articles. It explores their correlation, trending research topics, and notable articles, highlighting growing importance in recent years, focusing on areas like biomass digesters and sustainable consumption.
Chesterman, S (2024)	policy issues, property implications	This article examines two key policy issues affecting the impact of generative AI on the knowledge economy and creative sector: compensation for data used in training models and ownership of AI-generated output. It explores intellectual property implications and suggests lessons from the music industry's digital transition.
Goel, RK;	AI awareness,	This paper assesses artificial intelligence awareness across

Nelson, MA (2024)	wealthier states, economic freedom, gender ratios	U.S. states using Google search data. Results show that wealthier states and those with more internet users exhibit higher AI awareness. Gender ratios and demographics also influence awareness.
Estrada, MAR; et al. (2023)	AI's transformative potential in policy modeling	This paper evaluates AI's transformative potential in policy modeling. It compares Artificial Intelligence Response (AIR) with Human Intelligence Response (HIR) in addressing socio-economic challenges.
Heo, S; Byun, J; et al. (2024)	energy system, renewable energy scenarios driven by AI	This study examines decarbonizing large industrial parks using an integrated energy system (ALPG) and renewable energy scenarios (VRE) driven by AI.
Ulrich, S; et al. (2024)	Healthcare, mental healthcare	This study introduces Balance UP, a smartphone-based coaching intervention delivered by a conversational agent (CA), targeting frequent headaches. It aims to enhance mental well-being using behavior change techniques.
Salas-Velasco, M (2023)	Effectiveness, education, financial literacy	The study investigates chatbots' effectiveness in education using a randomized controlled experiment. Chatbots were more effective in economic and financial education than videos, particularly for financial literacy.
Ai, HS; et al. (2024)	regional unemployment, labor spatial allocation	This study investigates ChatGPT's impact on regional unemployment. Employs the difference-in-differences method to analyze labor spatial allocation. Results show informatization construction attracts labor, and stimulates economic growth, particularly benefiting tertiary and secondary industries.
Simshaw, D (2023)	Legal technology, efficiency, national regulatory reform	Legal technology can narrow the justice gap by enhancing efficiency and access to legal information. However, it can also perpetuate bias and inequality. State-by-state legal service regulation struggles to adapt to emerging AI tools like ChatGPT. This article advocates for national regulatory reform to address these challenges.
Wach, K; et al. (2023)	controversies, threats, defects, and disadvantages of GAI	This paper analyzes generative AI's (GAI) impact on business, focusing on ChatGPT. It identifies threats including regulation, quality control, job loss, data violation, socio-economic inequality, and technostress.

Iazdi, O, (2023)	biases in economic policy	The study examines biases in economic policy recommendations. Findings reveal: orthodoxy/heterodoxy concepts in Brazil, Economist self-identification correlates with perceived bias, and ChatGPT's recommendations.
Ettman, CK; Galea, S (2023)	mental health social and economic dynamics, opportunities, and challenges	As AI becomes ubiquitous, its implications for mental health draw attention. We outline three aspects: AI's role in mental healthcare, its impact on social and economic dynamics, and the policies governing its use, highlighting opportunities and challenges.
Mannuru, NR; et al. (2023)	infrastructure support，developing countries, economic growth	This paper examines the impact of generative AI on developing countries, highlighting economic growth, access to technology, and paradigm shifts in education, healthcare, and the environment. The findings stress the need for infrastructure support to ensure inclusive development and mitigate inequalities.
Guo, DH; et al. (2023)	challenges and opportunities to political, military, economic, cultural, social, ethical, and legal security	This paper details the framework and history of ChatGPT, examining challenges to political, military, economic, cultural, social, ethical, and legal security, as well as issues like machine escape and information leakage. It also discusses AIGC's potential opportunities in politics, military, cybersecurity, society, and education.
Lukauskas, M; et al. (2023)	labor market challenges, NLP skill generating job profiles	The labor market faces challenges from globalization, digitization, and skill demands. This study employs natural language processing to analyze Lithuanian job markets, creating automated job profiles. Results show effective use of NLP and clustering in assessing skill demands and generating job profiles.
Nay, JJ; et al. (2024)	legal analysis capabilities, tax law application	This study investigates Large Language Models' (LLMs) legal analysis capabilities, focusing on tax law application. It demonstrates LLMs' evolving legal understanding, improved performance over iterations, and the impact of providing additional legal context. Prompting techniques significantly enhance GPT-4's performance.

3.2.2 Micro Perspective

After excluding articles with low relevance to the topic and macro analysis, we conducted a detailed

analysis of the remaining articles. Multiple authors examine the microscopic impact of generative AI across multiple domains. According to the disciplinary field division of WOS, these articles belong to Economics, Computer Science, Information Systems and Software Engineering, Business, Finance and Management, Social Science, Education, Healthcare, and Hospitality.

The specific information of the articles in economic categories covered the impact and potential benefits of artificial intelligence on business and economy. These studies explore the transformative impact of generative AI and chatbots, on various economic aspects, including business productivity, consumer service, health economics, circular economy, customer interactions, education, and labor dynamics, emphasizing opportunities for automation, efficiency gains, and the need for ethical considerations (De Santis, 2024; Essa, 2024; Jiang et al., 2023; Korinek, 2023; Mcguire et al., 2023; Orchard & Tasiemski, 2023; Reason et al., 2024; Zota, Cimpeanu, et al., 2023). However, there are some biases and concerns about GAI in economic policy recommendations.

The specific information of the articles in Computer Science, Information Systems and Software Engineering categories, covered the impact and potential benefits of generative AI, chatbots and large language models, this category of articles focuses on technology, portfolio management, prediction, policy analysis, fraud detection, ethical challenges, and user involvement. On economic and financial research, agricultural productivity, disaster risk reduction, insurance services, and personalized sentiment analysis, the authors highlight their potential to enhance decision-making, communication, and operational efficiency (Anand et al., 2023; de Zarza et al., 2024; Palahan, 2022; Ravi & Vedapradha, 2023; Usip et al., 2022; Zheng et al., 2024).

The specific information of these articles in Business, Finance and Management Categories Analysis, widespread application of artificial intelligence in various industries, including HRM, accounting, investment, equity investment, circular economy, journalism, retail, entrepreneurship. This category of articles focuses on integrating, operational efficiency, promote innovation, competitive advantages, task automation, client engagement, asset allocation, factor performance, sustainability, digital literacy, technological advancements, globalization, innovation ecosystems, operations, crisis management, policy, financial stability, ecosystems, information seeking behavior and sustainable practices (Behera et al., 2023; Beheshti et al., 2023; Budhwar et al., 2023; Cheng & Tang, 2024; Cimpeanu et al., 2022; Forner & Ozcan, 2023; Kim, 2023; Zhao & Wang, 2024).

Multiple authors explore the generative AI impact on education, highlighting benefits such as enhanced student learning and economic advantages, while addressing challenges related to information accuracy, human interaction, ethical considerations, and the need for new assessment frameworks (Bansal et al., 2024; ElSayary, 2023; Kolade et al., 2024; Kshetri, 2023; Murphy & Mui, 2024; Salas-Velasco, 2023; Slater, 2024).

The widespread application of AI in various industries, including healthcare, was also explored. Multiple authors investigated the integration of AI technologies, particularly chatbots, in various healthcare applications, including diagnostics, mental health support, and personalized treatment,

highlighting their potential benefits, challenges, and economic implications (Abavisani et al., 2024; Mayo-Yanez et al., 2024; Ramachandran, 2024; Rathnayaka et al., 2022; Saldivia et al., 2023; Tan et al., 2024; Ulrich et al., 2024).

3.2.3 Factor-based Classification Analysis

Factor-based classification analysis is a statistical method used to classify observations or cases based on the underlying structure of variables. This approach allows researchers to identify meaningful subgroups and explore the relationships between these subgroups and the variables. In the following part, we will classify the factors affecting GAI studied by multiple authors based on content analysis to determine the most relevant factors to the economy. Table 7 list the categories on the economic impact factors of generative AI.

Table 7 summarized these classifications and provides a comprehensive overview of the themes related to the impact of generative AI on the economy and business, along with the key research hotspots and high-frequency influencing factors within each theme. We observe that these articles focus on specific factors affecting economic indicators, such as productivity, efficiency, innovation, circular economy, opportunity, reduced costs, personalized customer satisfaction, decision-making, interactions, prediction, production, and disaster alerts. Additionally, some scholars highlight concerns such as reduced perceived organizational ethics, increased turnover intentions, and new cybercrime risks. Researchers in this field can utilize this information to identify relevant topics for further investigation and explore the dynamics between various factors shaping the impact of AI on the economy and business.

Table 7. Factor-based Classification Analysis of Generative AI

Focus	Authors	Summary
Productivity	Noy & Zhang (2023)	This study examined college-educated professionals writing tasks. Participants use ChatGPT were more productive, efficient, and enjoyed the tasks more. ChatGPT carries policy implications for efforts to reduce productivity inequality
	Usip et al. (2022)	This study introduces a mobile chatbot for farmers in Uyo, Nigeria, based on data from the Ministry of Agriculture. The chatbot offers advice and information, aiding crop productivity and facilitating government-farmer communication.
	Korinek (2023)	This paper analyzes generative AI's (GAI) implications on business and the economy. Economists can reap significant productivity gains by taking advantage of generative AI to automate micro-tasks
Efficiency	Chowdhury et al. (2024)	This paper proposes a strategic HRM framework grounded in institutional entrepreneurship theory. Aiming to integrate GAI in HRM practice, improve operational efficiency, promote innovation, and gain competitive advantages

		through responsible practices and employee development.
	Kim (2023)	This study explores using ChatGPT's insights for investment decisions. We propose a quantitative approach where ChatGPT recommends asset classes under diverse economic conditions. Empirical findings suggest that ChatGPT's recommendations enhance portfolio efficiency
	Ravi & Vedapradha (2023)	This study examines the impact of KAYA, an AI-enabled insurance chatbot, on rural customer service. Efficiency and security were found to be critical predictors of economic and market performance.
Innovation	de Zarza et al., (2024)	This paper proposes innovative methodologies for individual and household financial planning. LLMs provides feasible solutions, promoting economic soundness and alignment with financial goals.
	Forner & Ozcan (2023)	This study examines the evolving boundaries of Systems of Innovation (SI) concepts due to technological and economic shifts, globalization, and interdependence. Using deep learning and natural language processing.
Circular economy	Zota, Cîmpeanu, et al. (2023)	Advanced technologies raise resource costs, urging a shift to circular economy models. This study explores how AI facilitates this transition. Utilizing mixed methods, it evaluates five chatbot solutions, informing the design and testing of a dedicated circular economy chatbot.
	Cimpeanu et al. (2022)	This article introduces how artificial intelligence can assist in the circular economy. Two chatbot solutions (A.I.R-e and Iio), which have been applied in the field of circular economy and play a role in helping humans.
	Beheshti et al. (2023)	This paper investigates why entrepreneurs in developing countries resist transitioning to circular economies (CEs) despite their sustainability benefits.
Opportunity	Brown (2023)	This article examines the transformative impact of digital technologies, particularly AI, on the economy and society. It contrasts theories of labor scarcity versus job scarcity, urging a reevaluation of education and work in the face of increasing job scarcity and the need for a new opportunity framework.
Reduced costs	Reason et al. (2024)	This study evaluates GPT-4's ability to automate health economic model construction. GPT-4 accelerated model development and reduced costs.
Personalized	Behera et al. (2023)	This study explores the relationship between COVID-19 protocols, online trust, and online health information seeking intention (OHISI) among athletes. Findings highlight the positive impact of online health information (OHI) on social, cultural, and economic aspects, with chatbots offering efficient

		personalized assistance.
	Essa (2024)	This paper explores AI's transformative impact on postsecondary education, emphasizing lifelong learning for adults. It highlights AI's potential to revolutionize learning methods, management, and accreditation, advocating for personalized, flexible education to meet evolving workforce needs effectively.
Customer satisfaction	De Santis (2024)	This study assesses chatbots' potential in improving consumer service within the logistics industry, identifies key satisfaction factors and highlights chatbots' efficacy in issue resolution and customer engagement.
Decision-making,	Palahan (2022)	This study proposes a chatbot-integrated system for personalized sentiment analysis, aiding entrepreneurs in decision-making, particularly in international trade and investment.
Interactions	Zhao & Wang (2024)	ChatGPT can streamline tasks, improve reporting, enhance auditing, and simplify client interactions, offers significant potential in accounting. This study offers insights for stakeholders to harness AI for accounting advancement.
Prediction, production	Zheng et al. (2024)	This paper explores the transformative potential of GAI in economic and financial research. It advocates for a new research paradigm, outlining five scenarios: portfolio management, prediction, scenario analysis, policy analysis, and fraud detection.
Disaster alerts	Anand et al. (2023)	This study suggests disaster risk reduction strategies for Indian coastal communities, proposing an AI chatbot for timely disaster alerts and resilience information.
Negative impact	Mcguire et al. (2023)	Chatbots offer economic benefits but customers prefer human interaction. Using chatbots without disclosure reduces perceived organization ethics and increases turnover intentions among employees, impacting the organization, customers, and employees negatively.
	Orchard & Tasiemski (2023)	This paper analyzes the implications of generative AI (GAI) on business and the economy, focusing on its rapid growth and maturation. It discusses adoption scenarios, from analytical tool to decision-making assistant, foreseeing disruptive, premium service opportunities and new cybercrime risks.

4. Conclusions

The development of AI technology poses new challenges for both the economy and economic research (Lu & Zhou, 2021). This paper reviews the evolution and structure of economics impact on GAI by using bibliometric methods. The results provide insights into the conceptual, social structure and emerging themes of GAI (Fosso et al., 2021). Findings show a growing emphasis on GAI's technical

aspects. However, fewer studies provide a systematic overview of the economic impact on GAI. Based on econometric analysis and content analysis, we have addressed the three issues proposed at the beginning of the article.

For Q1: From a macro perspective, which areas have been affected by GAI? Multiple authors examine the macro impact of generative AI, including policy modeling, economy, ethics, finance, agriculture, business, education, healthcare, labor, logistics, financial, education, investment, and circular economy. They examine issues such as job displacement, biases in policy recommendations, the evolution of education and healthcare systems, challenges within mental health and legal frameworks, as well as the incorporation of AI into circular economy and renewable energy initiatives.

For Q2: From a micro perspective, which industries have received more attention in research? In the retrieved articles, it can be found that the most concerning areas for scholars are Computer Science, Economics Categories, Education, Business, Environmental Sciences, and Management follow. Scholars have conducted extensive research in these fields, producing the most literature and providing rich references.

For Q3: How can enterprises utilize GAI to gain more economic benefits in future development? Through the bibliometric and content analysis, the most frequent focus areas are productivity, efficiency, innovation, circular economy, opportunity, reduced costs, personalized customer satisfaction, decision-making, interactions, prediction, production, and disaster alerts. These articles focus on specific factors affecting economic indicators. When facing the economic impact of GAI, enterprises should first consider these factors and adopt effective strategies to face future opportunities and challenges. For scholars, these high-frequency words can serve as future research focuses, and these factors could be established for research framework to comprehensively examine the impact of GAI on economics.

5. Limitations and Future Research

The results of this study should be interpreted with consideration of their limitations. Firstly, excluding publications not present in the WOS Core Collection database might have limited our analysis scope. Secondly, despite using well-established bibliometric tools, our insights are influenced by the authors' expertise. Thus, we cannot guarantee that all authors provide accurate information and categorization, which may introduce biases and errors. Thirdly, the rapidly expanding research landscape on GAI poses a challenge for comprehensive literature surveys, as new articles are continuously published, potentially limiting our data's comprehensiveness. Fourthly, our focus on GAI and Economics may have overlooked various economic indicators such as productivity, efficiency, and creativity, which could be valuable for future research.

The following ideas could be a valuable research direction:

1) In future research, longitudinal studies should be employed to examine the long-term impact of generative AI on employment, income distribution, and economic growth. Comparing the revenue and

profit of enterprises before and after adopting GAI could be a valuable research direction.

2) Most current research relies on qualitative analyses. Quantitative analysis could be used to comprehensively research how GAI can be leveraged for growth and competitiveness in small and medium enterprises (SMEs). Utilizing second-hand data surveys on economic growth, corporate income, profit, and GDP will allow for deeper research.

3) Currently, global economic disparities are becoming increasingly evident. Analyzing how generative AI affects the economies of developed and developing countries, and exploring these differences, can serve as a significant future research direction.

4) Existing research shows that some scholars have focused on human-AI collaboration, but there is a lack of studies on optimal ways for human workers to collaborate with AI systems to enhance productivity and job satisfaction.

5) The circular economy has been a research hotspot in recent years, with current research focusing on resource optimization, recycling and waste management, circular business models, efficiency in resource use, enhanced recycling processes, and innovation in business models. Some scholars have conducted research on generative AI and the circular economy, but there is a lack of research on conceptual integration. Future research should explore the integration of GAI and the circular economy and how GAI can improve the efficiency of the circular economy.

References

Abavisani, M., Khoshrou, A., Foroushan, S. K., & Sahebkar, A. (2024). Chatting with artificial intelligence to combat antibiotic resistance: Opportunities and challenges. *CURRENT RESEARCH IN BIOTECHNOLOGY*, *7*. https://doi.org/10.1016/j.crbiot.2024.100197

Abdirad, M., & Krishnan, K. (2020). Industry 4.0 in Logistics and Supply Chain Management: A Systematic Literature Review. *EMJ - Engineering Management Journal*, *33*(3), 1-15. https://doi.org/10.1080/10429247.2020.1783935

Acemoglu, D., & Restrepo, P. (2017). Secular stagnation? The effect of aging on economic growth in the age of automation. *American Economic Review*, *107*(5), 174-179.

Ai, H., Zhou, Z., & Yan, Y. (2024). The impact of Smart city construction on labour spatial allocation: Evidence from China. *APPLIED ECONOMICS*, *56*(19), 2337-2356. https://doi.org/10.1080/00036846.2023.2186367

Almada, P. (2022). *Gaining competitive advantage through artificial intelligence adoption Alvaro Rosa , Teresa Bento , Leandro Pereira * and Renato Lopes da Costa Álvaro Dias*, *17*(4), 386-406.

Anand, S., Raj, D., Sai, A. M. A., Rao, S. N., & Ramesh, M. V. (2023). Techno-Social Synergy for Disaster Resilience in Coastal Communities: A Sustainable Approach. *PROCEEDINGS OF THE 24TH INTERNATIONAL CONFERENCE ON DISTRIBUTED COMPUTING AND NETWORKING, ICDCN 2023*, 366-371. https://doi.org/10.1145/3571306.3571437

Arai, K. (2024). Law and Economics of Language Model Development: Empirical Examination of

Corporate Strategies and Vaporware Claims. *ASIAN JOURNAL OF LAW AND ECONOMICS*, *15*(1), 31-53. https://doi.org/10.1515/ajle-2023-0118

Aydın, Ö., & Karaarslan, E. (2023). Is ChatGPT Leading Generative AI? What is Beyond Expectations? *Academic Platform Journal of Engineering and Smart Systems*, *11*(3), 118-134. https://doi.org/10.21541/apjess.1293702

Baber, H., Nair, K., Gupta, R., & Gurjar, K. (2023). The beginning of ChatGPT—A systematic and bibliometric review of the literature. *Information and Learning Science*. https://doi.org/10.1108/ILS-04-2023-0035

Bansal, G., Mitchell, A., & Li, D. (2024). A Panel Report on Higher Education in the Age of AI from the Perspective of Academic Leaders in the Midwest U.S. *COMMUNICATIONS OF THE ASSOCIATION FOR INFORMATION SYSTEMS*, *54*. https://doi.org/10.17705/1CAIS.05413

Barahona, I., & Almulhim, T. (2024). Renewable energies and circular economies: A systematic literature review before the ChatGPT boom. *ENERGY REPORTS*, *11*, 2656-2669. https://doi.org/10.1016/j.egyr.2024.02.027

Behera, R. K., Bala, P. K., Rana, N. P., & Dwivedi, Y. K. (2023). Assessing the influence of COVID-19 protocol on online health information seeking intention of athletes in India. *BENCHMARKING-AN INTERNATIONAL JOURNAL*, *30*(8), 2670-2704. https://doi.org/10.1108/BIJ-11-2021-0718

Beheshti, M., Mahdiraji, H. A., & Rocha-Lona, L. (2023). Transitioning drivers from linear to circular economic models: evidence of entrepreneurship in emerging nations. *MANAGEMENT DECISION*. https://doi.org/10.1108/MD-02-2023-0279

Ben, A. J., van Dongen, J. M., El Alili, M., Heymans, M. W., Twisk, J. W. R., MacNeil-Vroomen, J. L., de Wit, M., van Dijk, S. E. M., Oosterhuis, T., & Bosmans, J. E. (2023). The handling of missing data in trial-based economic evaluations: should data be multiply imputed prior to longitudinal linear mixed-model analyses? *EUROPEAN JOURNAL OF HEALTH ECONOMICS*, *24*(6), 951-965. https://doi.org/10.1007/s10198-022-01525-y

Bigman, Y. E., Yam, K. C., Marciano, D., Reynolds, S. J., & Gray, K. (2021). Threat of racial and economic inequality increases preference for algorithm decision-making. *Computers in Human Behavior*, *122*(April). https://doi.org/10.1016/j.chb.2021.106859

Brown, P. (2023). Education, opportunity and the future of work in the fourth industrial revolution. *BRITISH JOURNAL OF SOCIOLOGY OF EDUCATION*. https://doi.org/10.1080/01425692.2023.2299970

Budhwar, P., Chowdhury, S., Wood, G., Aguinis, H., Bamber, G. J., Beltran, J. R., Boselie, P., Lee Cooke, F., Decker, S., DeNisi, A., Dey, P. K., Guest, D., Knoblich, A. J., Malik, A., Paauwe, J., Papagiannidis, S., Patel, C., Pereira, V., Ren, S., … Varma, A. (2023). Human resource management in the age of generative artificial intelligence: Perspectives and research directions on ChatGPT. *Human Resource Management Journal*, *33*(3), 606-659.

https://doi.org/10.1111/1748-8583.12524

Cascella, M., Montomoli, J., Bellini, V., & Bignami, E. (2023). Evaluating the Feasibility of ChatGPT in Healthcare: An Analysis of Multiple Clinical and Research Scenarios. *Journal of Medical Systems*, *47*(1), 33. https://doi.org/10.1007/s10916-023-01925-4

Cheng, Y., & Tang, K. (2024). GPT\'s idea of stock factors. *QUANTITATIVE FINANCE*. https://doi.org/10.1080/14697688.2024.2318220

Chesterman, S. (2024). Good models borrow, great models steal: Intellectual property rights and generative AI. *POLICY AND SOCIETY*. https://doi.org/10.1093/polsoc/puae006

Chowdhury, S., Budhwar, P., & Wood, G. (2024). Generative Artificial Intelligence in Business: Towards a Strategic Human Resource Management Framework. *BRITISH JOURNAL OF MANAGEMENT*. https://doi.org/10.1111/1467-8551.12824

Cimpeanu, I.-A., Dragomir, D.-A., & Zota, R. D. (2022). Using artificial intelligence for the benefit of the circular economy. *PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON BUSINESS EXCELLENCE*, *16*(1), 294-303. https://doi.org/10.2478/picbe-2022-0029

Company, M. &. (2022). *No Title*. Retrieved from https://www.mckinsey.com/featured-insights/2022-year-in-review/2022-the-year-in-charts

Dasborough, M. T. (2023). Awe-inspiring advancements in AI: The impact of ChatGPT on the field of Organizational Behavior. *Journal of Organizational Behavior (John Wiley & Sons, Inc.)*, *44*(2).

De Santis, P. R. (2024). Customer satisfaction in logistics: an analysis of chatbots in the leading companies of Colombia, Peru, and Ecuador. *RETOS-REVISTA DE CIENCIAS DE LA ADMINISTRACION Y ECONOMIA*, *14*(27), 115-130. https://doi.org/10.17163/ret.n27.2024.08

de Zarza, I., de Curto, J., Roig, G., & Calafate, C. T. (2024). Optimized Financial Planning: Integrating Individual and Cooperative Budgeting Models with LLM Recommendations. *AI*, *5*(1), 91-114. https://doi.org/10.3390/ai5010006

Dempere, J., Modugu, K., Hesham, A., & Ramasamy, L. K. (2023). The impact of ChatGPT on higher education. *Frontiers in Education*, *8*(September). https://doi.org/10.3389/feduc.2023.1206936

Dogru, T., Line, N., Mody, M., Hanks, L., Abbott, J., Acikgoz, F., Assaf, A., Bakir, S., Berbekova, A., Bilgihan, A., Dalton, A., Erkmen, E., Geronasso, M., Gomez, D., Graves, S., Iskender, A., Ivanov, S., Kizildag, M., Lee, M., … Zhang, T. (2023). Generative Artificial Intelligence in the Hospitality and Tourism Industry: Developing a Framework for Future Research. *JOURNAL OF HOSPITALITY \& TOURISM RESEARCH*. https://doi.org/10.1177/10963480231188663

ElSayary, A. (2023). An investigation of teachers' perceptions of using ChatGPT as a supporting tool for teaching and learning in the digital era. *JOURNAL OF COMPUTER ASSISTED LEARNING*. https://doi.org/10.1111/jcal.12926

Essa, A. (2024). The Future of Postsecondary Education in the Age of AI. *EDUCATION SCIENCES*, *14*(3). https://doi.org/10.3390/educsci14030326

Estrada, M. A. R., Park, D., & Staniewski, M. (2023). Artificial Intelligence (AI) can change the way

of doing policy modelling. *JOURNAL OF POLICY MODELING*, *45*(6), 1099-1112. https://doi.org/10.1016/j.jpolmod.2023.11.005

Farina, M., & Lavazza, A. (2023). ChatGPT in society: Emerging issues. *FRONTIERS IN ARTIFICIAL INTELLIGENCE*, *6*. https://doi.org/10.3389/frai.2023.1130913

Forner, D., & Ozcan, S. (2023). Examination of Overlapping Boundaries of Innovation Systems Using Deep Neural Network and Natural Language Processing. *IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT*. https://doi.org/10.1109/TEM.2023.3310198

Fosso Wamba, S., Bawack, R. E., Guthrie, C., Queiroz, M. M., & Carillo, K. D. A. (2021). Are we preparing for a good AI society? A bibliometric review and research agenda. *Technological Forecasting and Social Change*, *164*(December 2020). https://doi.org/10.1016/j.techfore.2020.120482

Gallifant, J., Fiske, A., Levites Strekalova, Y. A., Osorio-Valencia, J. S., Parke, R., Mwavu, R., Martinez, N., Gichoya, J. W., Ghassemi, M., Demner-Fushman, D., McCoy, L. G., Celi, L. A., & Pierce, R. (2024). Peer review of GPT-4 technical report and systems card. *PLOS Digital Health*, *3*(1), e0000417. https://doi.org/10.1371/journal.pdig.0000417

Gattupalli, S., Lee, W., Allessio, D., Crabtree, D., Arroyo, I., Woolf, B., & Woolf, B. (2023). *Exploring pre-service teachers' perceptions of large language models-generated hints in online mathematics learning*.

Groves, M., & Mundt, K. (2015). Friend or foe? Google Translate in language for academic purposes. *English for Specific Purposes*, *37*, 112-121. https://doi.org/https://doi.org/10.1016/j.esp.2014.09.001

Guo, D., Chen, H., Wu, R., & Wang, Y. (2023). AIGC challenges and opportunities related to public safety: A case study of ChatGPT. *JOURNAL OF SAFETY SCIENCE AND RESILIENCE*, *4*(4), 329-339. https://doi.org/10.1016/j.jnlssr.2023.08.001

Heo, S., Byun, J., Ifaei, P., Ko, J., Ha, B., Hwangbo, S., & Yoo, C. (2024). Towards mega-scale decarbonized industrial park (Mega-DIP): Generative AI-driven techno-economic and environmental assessment of renewable and sustainable energy utilization in petrochemical industry. *RENEWABLE \& SUSTAINABLE ENERGY REVIEWS*, *189*(A). https://doi.org/10.1016/j.rser.2023.113933

Iazdi, O. (2023). Ortho-Heterodox Biases and the Economist Algorithms of ChatGPT. *IBERIAN JOURNAL OF THE HISTORY OF ECONOMIC THOUGHT*, *10*(2), 79-90. https://doi.org/10.5209/ijhe.91545

Javaid, M., Haleem, A., & Singh, R. P. (2023). A study on ChatGPT for Industry 4.0: Background, potentials, challenges, and eventualities. *Journal of Economy and Technology*, *1*, 127-143. https://doi.org/https://doi.org/10.1016/j.ject.2023.08.001

Jiang, H., Brown, L., Cheng, J., Artist, A., Khan, M., Gupta, A., Workman, D., Hanna, A., Flowers, J., & Gebru, T. (2023). AI Art and its Impact on Artists. *PROCEEDINGS OF THE 2023 AAAI/ACM*

CONFERENCE ON AI, ETHICS, AND SOCIETY, AIES 2023, 363-374. https://doi.org/10.1145/3600211.3604681

Kim, J. H. (2023). What if ChatGPT were a quant asset manager. *FINANCE RESEARCH LETTERS*, *58*(D). https://doi.org/10.1016/j.frl.2023.104580

Kolade, O., Owoseni, A., & Egbetokun, A. (2024). Is AI changing learning and assessment as we know it? Evidence from a ChatGPT experiment and a conceptual framework. *HELIYON*, *10*(4). https://doi.org/10.1016/j.heliyon.2024.e25953

Korinek, A. (2023). Generative AI for Economic Research: Use Cases and Implications for Economists. *JOURNAL OF ECONOMIC LITERATURE*, *61*(4), 1281-1317. https://doi.org/10.1257/jel.20231736

Kshetri, N. (2023). The Economics of Generative Artificial Intelligence in the Academic Industry. *COMPUTER*, *56*(8), 77-83. https://doi.org/10.1109/MC.2023.3278089

Lee, C.-S., Wang, M.-H., Yen, S.-J., Wei, T.-H., Wu, I.-C., Chou, P.-C., Chou, C.-H., Wang, M.-W., & Yan, T.-H. (2016). Human vs. Computer Go: Review and Prospect [Discussion Forum]. *IEEE Computational Intelligence Magazine*, *11*(3), 67-72. https://doi.org/10.1109/MCI.2016.2572559

Lee, S. E., Ju, N., & Lee, K. H. (2023). Service chatbot: Co-citation and big data analysis toward a review and research agenda. *Technological Forecasting and Social Change*, *194*(July), 122722. https://doi.org/10.1016/j.techfore.2023.122722

Lu, Y., & Zhou, Y. (2021). A review on the economics of artificial intelligence. *Journal of Economic Surveys*, *35*(4), 1045-1072. https://doi.org/10.1111/joes.12422

Lukauskas, M., Sarkauskaite, V., Pilinkiene, V., Stundziene, A., Grybauskas, A., & Bruneckiene, J. (2023). Enhancing Skills Demand Understanding through Job Ad Segmentation Using NLP and Clustering Techniques. *APPLIED SCIENCES-BASEL*, *13*(10). https://doi.org/10.3390/app13106119

Mannuru, N. R., Shahriar, S., Teel, Z. A., Wang, T., Lund, B. D., Tijani, S., Pohboon, C. O., Agbaji, D., Alhassan, J., Galley, J., Kousari, R., Ogbadu-Oladapo, L., Saurav, S. K., Srivastava, A., Tummuru, S. P., Uppala, S., & Vaidya, P. (2023). Artificial intelligence in developing countries: The impact of generative artificial intelligence (AI) technologies for development. *INFORMATION DEVELOPMENT*. https://doi.org/10.1177/02666669231200628

Market Research Report. (2024). *Generative AI Market Size, Share & Industry Analysis, By Model (Generative Adversarial Networks or GANs and Transformer-based Models), By Industry vs Application, and Regional Forecast, 2024-2032*. Fortune Business Insights. Retrieved from https://www.fortunebusinessinsights.com/generative-ai-market-107837

Mayo-Yanez, M., Gonzalez-Torres, L., Saibene, A. M., Allevi, F., Vaira, L. A., Maniaci, A., Chiesa-Estomba, C. M., & Lechien, J. R. (2024). Application of ChatGPT as a support tool in the diagnosis and management of acute bacterial tonsillitis. *HEALTH AND TECHNOLOGY*. https://doi.org/10.1007/s12553-024-00858-3

McCarthy, J., Minsky, M. L., Rochester, N., & Shannon, C. E. (2006). A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence, August 31, 1955. *AI Magazine*, *27*(4), 12. https://doi.org/10.1609/aimag.v27i4.1904

Mcguire, J., De Cremer, D., Hesselbarth, Y., De Schutter, L., Mai, K. M., & Van Hiel, A. (2023). The reputational and ethical consequences of deceptive chatbot use. *SCIENTIFIC REPORTS*, *13*(1). https://doi.org/10.1038/s41598-023-41692-3

Mondal, S., Das, S., & Vrana, V. G. (2023). How to Bell the Cat? A Theoretical Review of Generative Artificial Intelligence towards Digital Disruption in All Walks of Life. *Technologies*, *11*(2). https://doi.org/10.3390/technologies11020044

Murphy, J. S., & Mui, C. (2024). Neuropower and plastic writing: Stiegler and Malabou on generative AI. *EDUCATIONAL PHILOSOPHY AND THEORY*. https://doi.org/10.1080/00131857.2024.2333854

Nay, J. J., Karamardian, D., Lawsky, S. B., Tao, W., Bhat, M., Jain, R., Lee, A. T., Choi, J. H., & Kasai, J. (2024). Large language models as tax attorneys: A case study in legal capabilities emergence. *PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A-MATHEMATICAL PHYSICAL AND ENGINEERING SCIENCES*, *382*(2270). https://doi.org/10.1098/rsta.2023.0159

Noy, S., & Zhang, W. (2023). Experimental evidence on the productivity effects of generative artificial intelligence. *Science*, *381*(6654), 187-192. https://doi.org/10.1126/science.adh2586

Ooi, K. B., Tan, G. W. H., Al-Emran, M., Al-Sharafi, M. A., Capatina, A., Chakraborty, A., Dwivedi, Y. K., Huang, T. L., Kar, A. K., Lee, V. H., Loh, X. M., Micu, A., Mikalef, P., Mogaji, E., Pandey, N., Raman, R., Rana, N. P., Sarker, P., Sharma, A., … Wong, L. W. (2023). The Potential of Generative Artificial Intelligence Across Disciplines: Perspectives and Future Directions. *Journal of Computer Information Systems*, *00*(00), 1-32. https://doi.org/10.1080/08874417.2023.2261010

Orchard, T., & Tasiemski, L. (2023). The rise of Generative AI and possible effects on the economy. *ECONOMICS AND BUSINESS REVIEW*, *9*(2), 9-26. https://doi.org/10.18559/ebr.2023.2.732

Ouyang, R., Mu, E., Yu, Y., Chen, Y., Hu, J., Tong, H., & Cheng, Z. (2024). Assessing the effectiveness and function of the water resources tax policy pilot in China. *ENVIRONMENT DEVELOPMENT AND SUSTAINABILITY*, *26*(1), 2637-2653. https://doi.org/10.1007/s10668-022-02667-y

Palahan, S. (2022). News Analytics for Business Sentiment Suggestion. *INTERNATIONAL JOURNAL OF ADVANCED COMPUTER SCIENCE AND APPLICATIONS*, *13*(7), 677-684.

Ramachandran, M. (2024). AI AND BLOCKCHAIN FRAMEWORK FOR HEALTHCARE APPLICATIONS. *FACTA UNIVERSITATIS-SERIES ELECTRONICS AND ENERGETICS*, *37*(1), 169-193. https://doi.org/10.2298/FUEE2401169R

Rathnayaka, P., Mills, N., Burnett, D., De Silva, D., Alahakoon, D., & Gray, R. (2022). A Mental Health Chatbot with Cognitive Skills for Personalised Behavioural Activation and Remote Health Monitoring. *SENSORS*, *22*(10). https://doi.org/10.3390/s22103653

Ravi, H., & Vedapradha, R. (2023). Artificial intelligence service agents: A silver lining in rural India. *KYBERNETES*. https://doi.org/10.1108/K-09-2022-1239

Reason, T., Rawlinson, W., Langham, J., Gimblett, A., Malcolm, B., & Klijn, S. (2024). Artificial Intelligence to Automate Health Economic Modelling: A Case Study to Evaluate the Potential Application of Large Language Models. *PHARMACOECONOMICS-OPEN*, *8*(2), 191-203. https://doi.org/10.1007/s41669-024-00477-8

Research, G. view. (2019). 9. Artificial Intelligence and Economic Growth. In A. Agrawal, J. Gans, & A. Goldfarb (Eds.), *An Agenda* (pp. 237-290). University of Chicago Press. https://doi.org/doi:10.7208/9780226613475-011

Salas-Velasco, M. (2023). Economic and financial education for investment and financing decision-making in a graduate degree: Experimental evaluation of the effectiveness of two delivery methods. *JOURNAL OF ECONOMIC EDUCATION*, *54*(3), 225-242. https://doi.org/10.1080/00220485.2023.2191594

Saldivia, S., Aslan, J., Cova, F., Bustos, C., Inostroza, C., & Castillo-Carreno, A. (2023). Life satisfaction, positive affect, depression and anxiety symptoms, and their relationship with sociodemographic, psychosocial, and clinical variables in a general elderly population sample from Chile. *FRONTIERS IN PSYCHIATRY*, *14*. https://doi.org/10.3389/fpsyt.2023.1203590

Simshaw, D. (2023). TOWARD NATIONAL REGULATION OF LEGAL TECHNOLOGY: A PATH FORWARD FOR ACCESS TO JUSTICE. *FORDHAM LAW REVIEW*, *92*(1), 1-55.

Slater, G. B. (2024). Dread and the automation of education: From algorithmic anxiety to a new sensibility. *REVIEW OF EDUCATION PEDAGOGY AND CULTURAL STUDIES*, *46*(1, SI), 170-182. https://doi.org/10.1080/10714413.2023.2299521

Tan, M., Xiao, Y., Jing, F., Xie, Y., Lu, S., Xiang, M., & Ren, H. (2024). Evaluating machine learning-enabled and multimodal data-driven exercise prescriptions for mental health: A randomized controlled trial protocol. *FRONTIERS IN PSYCHIATRY*, *15*. https://doi.org/10.3389/fpsyt.2024.1352420

Thomas, D. S. (2022). Annual Report on U.S. Manufacturing Industry Statistics: 2022. *Advanced Manufacturing Series (NIST AMS), National Institute of Standards and Technology*, 100-149.

Ulrich, S., Gantenbein, A. R., Zuber, V., Von Wyl, A., Kowatsch, T., & Kunzli, H. (2024). Development and Evaluation of a Smartphone-Based Chatbot Coach to Facilitate a Balanced Lifestyle in Individuals With Headaches (BalanceUP App): Randomized Controlled Trial. *JOURNAL OF MEDICAL INTERNET RESEARCH*, *26*. https://doi.org/10.2196/50132

Usip, P. U., Udo, E. N., Asuquo, D. E., & James, O. R. (2022). A Machine Learning-Based Mobile Chatbot for Crop Farmers. In F. Ortiz-Rodrguez, S. Tiwari, M. A. Sicilia, & A. Nikiforova (Eds.), *ELECTRONIC GOVERNANCE WITH EMERGING TECHNOLOGIES, EGETC 2022* (Vol. 1666, pp. 192-211). SPRINGER INTERNATIONAL PUBLISHING AG. https://doi.org/10.1007/978-3-031-22950-3_15

Wach, K., Duong, C. D., Ejdys, J., Kazlauskaite, R., Korzynski, P., Mazurek, G., Paliszkiewicz, J., & Ziemba, E. (2023). The dark side of generative artificial intelligence: A critical analysis of controversies and risks of ChatGPT. *ENTREPRENEURIAL BUSINESS AND ECONOMICS REVIEW*, *11*(2), 7-30. https://doi.org/10.15678/EBER.2023.110201

Wang, F. Y., Ding, W., Wang, X., Garibaldi, J., Teng, S., Imre, R., & Olaverri-Monreal, C. (2022). The DAO to DeSci: AI for Free, Fair, and Responsibility Sensitive Sciences. *IEEE Intelligent Systems*, *37*(2), 16-22. https://doi.org/10.1109/MIS.2022.3167070

Zhao, J. (Jingwen), & Wang, X. (2024). Unleashing efficiency and insights: Exploring the potential applications and challenges of ChatGPT in accounting. *JOURNAL OF CORPORATE ACCOUNTING AND FINANCE*, *35*(1), 269-276. https://doi.org/10.1002/jcaf.22663

Zheng, X., Li, J., Lu, M., & Wang, F.-Y. (2024). New Paradigm for Economic and Financial Research With Generative AI: Impact and Perspective. *IEEE Transactions on Computational Social Systems*, 1-11. https://doi.org/10.1109/TCSS.2023.3334306

Zota, R. D., Cimpeanu, I. A., & Dragomir, D. A. (2023). Use and Design of Chatbots for the Circular Economy. *SENSORS*, *23*(11). https://doi.org/10.3390/s23114990

Zota, R. D., Cîmpeanu, I. A., & Dragomir, D. A. (2023). Use and Design of Chatbots for the Circular Economy. *Sensors*, *23*(11). https://doi.org/10.3390/s23114990

Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational Research Methods*, *18*(3), 429-472.