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Paradoxes of Generative Artificial Intelligence: A Systematic Literature Review and Research Agenda

FERNANDO ARAÚJO BRAZ
UNIVERSIDADE FEDERAL DE SANTA MARIA

GABRIEL KUFNER
UNIVERSIDADE FEDERAL DE SANTA MARIA (UFSM)

JULIANO NUNES ALVES
UNIVERSIDADE FEDERAL DE SANTA MARIA (UFSM)

KATHIANE BENEDETTI CORSO
FUNDAÇÃO UNIVERSIDADE FEDERAL DO PAMPA - UNIPAMPA (UNIPAMPA)

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1. Introduction

Artificial Intelligence (AI) has been the center of attention for some time now. Turing (1996) had already foreseen that a moment would come when machines would perform actions similar to thinking. Likewise, Simon (1969) had also pointed out that it would be easier to seek to understand Artificial Intelligence than to ignore it. In this sense, Weiser (1991) already indicated that technologies would become ubiquitous in human lives, aligning with what Elias et al. (2023) currently highlights the presence of Generative AI in the most diverse fields.

Generative Artificial Intelligence (GAI), based on probabilistic algorithms and Large Language Models (LLMs), represents an inflection point in the contemporary technological paradigm by combining Machine Learning (ML) and Natural Language Processing (NLP). In addition to simulating cognitive processes, GAI expands the frontiers of computational autonomy in generating multimodal content. This advancement imposes a paradoxical scenario on organizations and managers, where innovative benefits coexist with ethical, strategic, and operational dilemmas that are still underexplored in academic literature (Turing, 1996; Brynjolfsson et al., 2025). To address this gap, this study adopts the lens of paradoxes to critically investigate the emerging tensions in the adoption and use of GAI. Specifically, it adopts the perspective of paradox used by Mick and Fournier (1998), where the authors emphasize that a paradox can be X and not-X, not necessarily being something positive and negative. This approach is used to identify its positive and negative points and to analyze the perceptions of specific groups with diverse opinions about this disruptive tool.

Launched in 2022, ChatGPT became the most widely used GAI at its release, reaching over 1 million users in five days and 100 million in two months (OpenAI, 2022). However, due to the rapid pace at which this technology is advancing, it was surpassed in 2025 by the Chinese algorithm DeepSeek, which became the most downloaded application in less than a week after its launch (Fraser, 2025).

Therefore, given the rapid advancement of this technology and its presence in the daily life of society (Elias et al., 2023), there is significant academic interest in researching the use of this tool and its benefits (Alqahtani et al., 2023; Bauer et al., 2023; Mohapatra et al., 2023). However, this rapid technological development, which brings significant advances to society, is highlighted by Atarodi and Atarodi (2022) as a change that can bring both positive and negative aspects, which must be cultivated and/or moderated. Furthermore, it is evident that researchers are also examining the points contrary to the benefits generated by GAI, referred to as challenges (Coeckelbergh & Gunkel, 2023; Lund et al., 2023; Perkins, 2023).

Although the literature on Generative Artificial Intelligence (GAI) has grown exponentially, a theoretical approach grounded in the perspective of paradoxes remains incipient (Ferraro et al., 2024; Lim et al., 2023; Osadchaya et al., 2024). Mick and Fournier (1998) had already warned that paradoxical tensions not only coexist but also profoundly shape perceptions and practices in technological contexts. However, the few studies that apply this lens still lack articulation with the strategic and operational dilemmas faced by organizations in adopting GAI, configuring a relevant gap that the present study seeks to address. Nevertheless, some authors are already warning of the existence of paradoxes in the use of GAI (Berthon et al., 2024; Chen et al., 2024).

However, new investigations into this phenomenon are necessary, as is an understanding of the different variations that can be used to address the opposing tensions affecting individuals when using GAI. As Zolfagharian and Yazdanparast (2017) note, the study of paradoxes allows for an equal exploration of positive and negative points, given that this phenomenon is inherent to the individual's experience with technology. Therefore, much like the terms "two sides of the same coin" and "double-edged sword" used by Atarodi and Atarodi (2022) and Shen et al. (2023) to discuss the consequences of technology, the present study seeks to encompass words that share the same semantic meaning as "paradoxes."

Based on this, this Systematic Literature Review (SLR) was conducted in the Web of Science and Scopus databases, starting from the following research problem: **"What is the state of scientific production in the field of the paradoxes of Generative Artificial Intelligence?"** This study aims to map and critically analyze the recent scientific literature on the paradoxes of Generative Artificial Intelligence, identifying conceptual, methodological, and applied gaps, and proposing a research agenda capable of grounding new investigations and organizational management practices in the face of these tensions.

It should be noted that, after a search of the databases, no similar studies using SLRs to study this phenomenon were found, reinforcing the originality and relevance of the study. The studies found that mention issues of paradox typically cite the work of Lim et al. (2023) and end up being linked in searches, but they do not address the phenomenon itself, only the use of GAI (Tirpan, 2024; Suprobo et al., 2024; Yang et al., 2024). An exception is Garcia (2024), who addresses a review of paradoxes but focuses on the paradox of creativity, whereas the present study seeks to cover paradoxes more broadly (according to the perspective of Mick and Fournier, 1998).

The study's contribution to the field of Administration is also highlighted. A better understanding of the use of GAI, especially in the academic environment, is a key factor for the development of a new generation of students and teachers, given that this is one of the areas that most utilizes the tool (Braz & Alves, 2024; Elias et al., 2023; Jin et al., 2024). Similarly, Lewis (2014) emphasizes that understanding different tensions/paradoxes leads to better performance and more sustainable implementations/uses within an organization. Furthermore, the study of paradoxes seeks to go beyond the superficial distinction between positive and negative, aiming to understand the best ways to use technologies and ensure sustainability and longevity in their use and in the user's health (Lewis, 2000; Lewis, 2014).

The use of systematic reviews, such as the one proposed here, is of great importance for the development of science, according to Tranfield et al. (2003), given the systematic synthesis of knowledge, which allows for the identification of opportunities for new studies and applications.

2. Theoretical Background

Artificial Intelligence (AI) currently under debate has been mentioned since Simon's (1969) work on the sciences of the artificial, where the author stressed the need to study AI rather than ignore it. Similarly, Turing (1996) asserted that it was mathematically possible to predict the existence of machines with functions close to "thinking." In this sense, the field of modern AI took its first steps with Turing in the 20th century, when he understood that for a machine to be "intelligent," it did not need to provide correct answers, but rather responsive ones—that is, as if it could understand the human's question (Berthon et al., 2024; Schulman, 2023; Turing, 1996). Thus, AI is

understood to involve machines, or technologies in general, capable of thinking, reasoning, and creating, much like human beings (Berthon et al., 2023).

In turn, as Bahn and Strobel (2023) highlight, Generative Artificial Intelligence (GAI) was an evolution in the field of AI that drastically expanded its capabilities. While traditional AI focuses on prediction and classification, always based on pre-existing data and information, Generative AI uses existing data and information to create new content from them, showcasing its creative and statistical nature (Bahn & Strobel, 2023).

To use Generative AI technology, tools have been developed by various companies. In addition to OpenAI's ChatGPT, tools like Gemini, DALL-E, Claude, and WatsonX, among others, assist in multiple tasks by generating content through artificial intelligence (Zhu et al., 2024). These software applications can help with creative responses, integration with other services, image and video generation, coding assistance, and audio generation and transcription, etc. (Ooi et al., 2025).

A relevant algorithm present in Generative Artificial Intelligence is the Large Language Model (LLM), which stands out for the vast amount of text it can analyze in a short period to generate pertinent solutions (Farina & Lavazza, 2023). This type of artificial intelligence functions by learning and improving as the individual types their needs into the chat. LLMs are distinct from Generative AI, as they represent a part of GAI but not its entirety. While GAI is a broader concept capable of performing tasks that cannot be assigned to LLMs, such as generating images, videos, audio, and multimodal models (Hagos et al., 2024; Farina & Lavazza, 2023), this is because LLMs focus exclusively on text-based languages (Hagos et al., 2024).

Within this scenario, where various tools have been created to meet individual demands, the most diverse uses of this technology are evident, as are the various fields that implement GAI (Elias et al., 2023). From this widespread use, several authors began to investigate the opportunities (Alqahtani et al., 2023; Bauer et al., 2023; Mohapatra et al., 2023) and challenges related to GAI (Coeckelbergh & Gunkel, 2023; Lund et al., 2023; Perkins, 2023).

However, Chen et al. (2024) point out that these challenges and opportunities highlighted by other authors reveal a paradoxical reality regarding the use and consequences of GAI. Aligning with this approach, Berthon et al. (2024) note that the most diverse innovations have brought advancements and opportunities to humanity, helping them overcome their limitations (such as cars, smartphones, computers, etc.), yet these same technologies have ended up making the population ill.

This reality was already observed by Mick and Fournier (1998) with the technologies of their time, when the authors noted that their peers sought to highlight the positive and negative points of each technology. However, Mick and Fournier (1998) found that these positive and negative consequences occurred concurrently and sought to use the perspective of paradoxes to understand how to deal with these effects.

In this sense, a paradox, according to Lewis (2000), is something contradictory that has interrelated elements. Later, Lewis (2014) describes paradoxes as tensions that exert ubiquitous and constant forces, both challenging and nurturing long-term success. In their work, Mick and Fournier (1998) adopt the view that paradoxes are opposing tensions that happen at the same time; that is, technology is/does both X and not-X. It is emphasized that the present study uses this perspective from Mick and Fournier (1998) for the understanding and analysis of what constitutes a paradox in the investigated corpus.

Furthermore, Lewis (2000; 2014) highlights that the study of paradoxes goes beyond the simple distinction between positive and negative aspects, seeking ways of use that promote sustainability, the longevity of the technology, and the well-being of the

user. It is also noted that the paradox perspective is usually used to examine a task, such as in Mick and Fournier's (1998) study on the acquisition of new technologies and Jarvenpaa and Lang's (2005) work seeking to understand mobility through smartphones.

Regarding GAIs, Lim et al. (2023) proposed that technology presents a paradoxical reality that can be disruptive and transformative or cause the field of education to be rethought from scratch. Subsequently, Ferraro et al. (2024) sought to identify paradoxes in the use of GAI chatbots in customer service, and Osadchaya et al. (2024) identified operational and psychological paradoxes in the advertising sector.

3. Methodology

To achieve the objective of this study, which is to analyze the state of scientific production on Paradoxes in Generative Artificial Intelligence, a Systematic Literature Review (SLR) was conducted according to the protocol by Tranfield et al. (2003). The authors highlight that this protocol allows for the mapping and evaluation of the conceptual and intellectual structure of a given field of study based on a pre-established research problem, thereby contributing to the advancement of the field (Tranfield et al., 2003). Thus, the Tranfield et al. (2003) protocol is divided into three stages, which can be seen in Table 1.

Table 1

Stages, Description, Steps, and Results of the Tranfield et al. (2003) SLR Protocol

Stage	Description	Step	Result
Stage 1: Planning the Review	Definition of the Protocol, Research Question, and Inclusion and Exclusion Criteria.	Definition of the problem, research objective, databases, and inclusion and exclusion criteria. **Strings**: "large language model*" OR "chatgpt" OR "generative AI" AND "paradox*" OR "tension*" OR "antagonism*" OR "contradict*" OR "opposit*" OR "poles" OR "ambivalenc*" OR "double-edged sword" OR "controver*" **Filter**: Open Access.	**Objective:** To analyze the scientific landscape of paradoxes in Generative Artificial Intelligence, seeking to present a current overview of the studies and enabling the proposal of a research agenda with new possibilities for study. **Method:** SLR (Systematic Literature Review) with two databases and qualitative analysis.
Stage 2: Conducting the Review	Searching the databases using search strings and applying the Inclusion and Exclusion criteria based on the study's objective, in addition to removing duplicate and irrelevant documents.	Application of search strings and the filter; Articles Included and Excluded; Removal of duplicate papers and those that do not fit the	**Initial search with strings:** Web of Science N=322**;** Scopus N=195 **Search after filtering:** Web of Science N=172; Scopus N=64 **Merging of databases (R Studio Software) and removal of duplicates:** N=194 **Excluded:** Duplicates 42; Out of Scope 28
Stage 3: Knowledge Dissemination	Reporting of the selected papers, annual distribution, analysis of authorships, and the most relevant keywords.	Choice of software for merging the databases and for data analysis: The Bibliometrix and Biblioshiny package in the R Studio Software.	Bibliometric Indicators and Qualitative Analysis of Categories.

Source: developed by the authors based on Tranfield *et al.* (2003).

Data collection took place on December 3, 2024, using the search strings "large language model*" OR "chatgpt" OR "generative AI" to find studies addressing the use of GAI, and "paradox*" OR "tension*" OR "antagonism*" OR "contradict*" OR "opposit*" OR "poles" OR "ambivalenc*" OR "double-edged sword" OR "controver*" to identify the different connotative semantics that encompass the understanding of paradoxes and their synonyms. These choices align with the definition of a paradox, which is formed by opposing forces that seem logical when separate but irrational when simultaneous—that is, something contradictory yet with interrelated elements (Lewis, 2000; Lewis, 2014; Robidoux, 2024).

Regarding the application of filters, Open Access papers were chosen, considering the ethical and financial issues involved in accessing a large number of papers in an SLR. Piwowar et al. (2018) point out that, based on citation counts, open-access papers have, on average, higher visibility and impact than those requiring a subscription or individual payment, resulting in greater transparency and scientific reproducibility when using only Open Access studies. As for the time frame, no period was set during the searches, leaving it open, given that publications on GAIs are very recent, with the technology becoming a central topic of discussion in 2022 with the launch of ChatGPT (OpenAI, 2022).

Thus, an initial 322 papers were obtained from the Web of Science database and 195 from Scopus using the search strings. Subsequently, the filter for only Open Access papers was applied, resulting in a total of 174 papers from Web of Science and 64 from Scopus (174+64=238). After merging the databases with R Studio software to exclude duplicate documents (N=42), a textual corpus of 194 documents was reached (238-42=194). From this stage, the abstracts of the documents were read to apply inclusion and exclusion criteria, removing files that did not fit the scope of the research, such as the work of Dickson & Hobolt (2024), which used terms linked to the search strings but discussed far-right parties and the climate change agenda. Studies that addressed Artificial Intelligence in a generic way, rather than focusing on Generative AI, were also excluded (Bawa et al., 2023; Hallo-Carrasco et al., 2023). On the other hand, studies that specifically dealt with Generative AI, as well as LLMs as something similar to this technology, were kept.

Therefore, after excluding the papers that did not align with the study's objective (N=28), the final textual corpus consists of a total of 166 papers (N=166), which were analyzed according to the laws of Lotka, Bradford, and Zipf (Bradford, 1934; Hollingshead & Zipf, 1949; Lotka, 1926). Thus, the authors' production on the topic was examined, the main journals publishing on the subject were identified, and the most used terms in the keywords were verified, using descriptive statistics in tables to show how knowledge is distributed in the field (Bradford, 1934; Hollingshead & Zipf, 1949; Lotka, 1926). In addition to these laws, the papers were analyzed qualitatively through a narrative analysis, being separated into categories according to the topics they address.

4. Discussion

From the results obtained in conducting the SLR and constructing the textual corpus, it is possible to see the landscape of scientific production on paradoxes in Generative Artificial Intelligence.

4.1. Description of the Textual Corpus and Bibliometric Laws

In this sense, the present SLR found that scientific production on the topic is present in 36 countries, according to the textual corpus, led by the United States with a total of 40 papers, followed by China with 17, Germany with 14 publications, and the United Kingdom with 13, while Brazil appears in the corpus with only 2 publications on the topic. Thus, the 166 documents pointed to a result of 139 different journals that have published on the topic, with publications by 685 authors and co-authors registered in the Scopus and Web of Science databases.

Regarding annual publications on the topic, considering that no time period was defined in the filters, it can be seen that the topic had only 1 paper published in the years 2021 and 2022. After the emergence of ChatGPT at the end of 2022 (OpenAI, 2022), there was a large increase in the number of papers published on the subject, rising to 52 publications in 2023 and reaching 111 in the year 2024. The results reflect the novelty factor of the technology and its popularity since the launch of Generative tools (Alqahtani et al., 2023; Bauer et al., 2023; Elias et al., 2023; Mohapatra et al., 2023).

This novelty factor that GAI currently carries, as mentioned earlier, is seen through Lotka's Law (Lotka, 1926), which seeks to measure the productivity of authors on a given topic. Therefore, Lotka's Law (1926), applied to the present review, indicates that 98.1% of the authors (N=683) have only 1 paper written within the textual corpus, while only 13 authors (1.9%) have two papers. This comes with a publication growth rate of 113.46% between 2023 and 2024, that is, from its diffusion in society.

Regarding the universities that produce the most on the topic, the institutions and their publication frequency can be seen in Table 2, based on the corpus of this review. It

should be noted that this metric is based on a combination of publication counts, citation analysis, and network analysis to determine the most relevant affiliations in a research field (Aria & Cuccurullo, 2017).

Table 2

Affiliations with the Highest Publication Frequency

Affiliation	Freq.
EMORY UNIVERSITY	10
SICHUAN UNIVERSITY	7
NATIONAL UNIVERSITY OF SINGAPORE	6
GEORGE MASON UNIVERSITY	5
IMPERIAL COLLEGE LONDON	5
KING SAUD UNIVERSITY	5
UNIVERSITY OF CALIFORNIA SAN DIEGO	5
CHONGQING MEDICAL UNIVERSITY	4
CHONGQING UNIVERSITY OF POSTS AND	4
DEMOCRITUS UNIVERSITY OF THRACE	4

Thus, regarding the institutions that produce the most on the topic, Emory University in the United States is identified with the highest number of publications (10 papers). However, Asia has the largest number of institutions among the top ten publishers on the subject, according to the results of this sample. For example, Sichuan University (China), the National University of Singapore (Singapore), Chongqing Medical University (China), and Chongqing University of Posts and Telecommunications (China). These are followed by the United States, with Emory University, George Mason University, and the University of California, San Diego. Meanwhile, other countries each have only one institution in the top ten with the most publications on the topic: Imperial College London in England, King Saud University in Saudi Arabia, and Democritus University of Thrace in Greece.

Another result that is important to understand is the impact and relevance of scientific production within the theme. This information is visualized through the G-index and H-index metrics of the authors. The former seeks to verify the relevance of a given author's scientific production (Egghe, 2006). The H-index, in turn, is related to the number of citations an author has that is greater than or equal to their number of publications (Sidiroopulos, 2006). Such metrics can be viewed in Table 3, according to their ranking by G-index and H-index.

Table 3

Author and their G-index and H-index

Author	H-index	G-index	Total Citations
CHOI E	2	2	5
FERRARA E	2	2	5
ABDELFATTAH F	1	1	11
AGARWAL A	1	1	43
AGARWAL V	1	1	3
AGHARIA S	1	1	2
AHMED W	1	1	22
AKAGAMI R	1	1	4
AL H H	1	1	11
AL-KHALIFA H	1	1	1

Regarding the G-index and H-index metrics, it can be observed that the only authors who have more than one publication with a citation count greater than this number of publications are Choi and Ferrara (2024a), and Choi and Ferrara (2024b), where the authors appear together in two different studies. On the other hand, the number of citations that the aforementioned authors have is lower than that of authors such as AHMED W – an author who appears in alphabetical order in Table 3 – present in the study by Rajjoub et al. (2023), who, however, does not have many citations on one of his works.

According to the bibliometric law concerning the dispersion of studies and where they are being published (journals), known as Bradford's Law (1934), it is possible to identify the main journals that are publishing on the topic (Table 4).

Table 4

Top Journals and conferences that published on Paradoxes in Generative AI (Bradford's Law)

Journal/Conference	Rank	Freq.	Cum. Freq.
CUREUS JOURNAL OF MEDICAL SCIENCE	1	5	5
AI & SOCIETY	2	4	9
JOURNAL OF MEDICAL INTERNET RESEARCH	3	4	13
PROCEEDINGS OF THE 2024 CHI CONFERENCE ON HUMAN FACTORS IN COMPUTING SYTEMS, CHI 2024	4	4	17
HUMANITIES & SOCIAL SCIENCES COMMUNICATIONS	5	3	20
BIG DATA & SOCIETY	6	2	22
BUSINESS HORIZONS	7	2	24
COMPUTERS AND EDUCATION: ARTIFICIAL INTELLIGENCE	8	2	26
FINDINGS OF THE ASSOCIATION FOR COMPUTATIONAL LINGUISTICS: EMNLP 2023	9	2	28
FUTURES	10	2	30

From this data, it is observed that the medical field appears in the top positions with 9 publications divided between two journals, while events and journals that address social and human issues accumulate a total of 13 publications, but divided among four different outlets. In this sense, it is noted that the studies align with Elias et al. (2023), who addressed the impact this technology would have on the health and education fields, given the attention these areas are giving to GAI, which is reflected in the fields that are publishing the most on the topic.

In terms of impact, regarding the G-index and H-index of the publication sources, the *Cureus Journal of Medical Science* remains in first place, presenting a G-index=5 and H-index=4. In second and third place are the *Journal of Medical Internet Research* with G=4 and H=3, and the journal *Business Horizons* with G=2 and H=2. This result indicates a certain impact and relevance of the topic in the medical field, where the first two journals correspond to health, while the third-place journal has a scope focused on the business area.

Thus, continuing the analysis, we sought to verify Zipf's Law (Hollingshead & Zipf, 1949), which reveals the main terms used that appear constantly in the different works, ranking them by occurrence according to their citations on the topic. In Table 5, it is possible to visualize these terms according to the Keywords listed by the authors and the Keywords Plus, which are those generated by the databases (Scopus and Web of Science).

Table 5

Author Keywords and Keywords Plus from the Databases (Zipf's Law)

Author Keywords	Occurence	Keywords Plus	Occurrence
artificial intelligence	58	language model	14
chatgpt	55	artificial-intelligence	10
generative ai	26	computational linguistics	10
large language models	19	large language model	8
ai	14	artificial intelligence	5
large language model	11	information	5
education	10	ai	4
machine learning	9	chatbots	4
intelligence	8	machine	4
natural language processing	8	model	4

The results related to Zipf's Law (Hollingshead & Zipf, 1949) present, in both keyword types, a range of different terms that correspond to the technology itself, such as: artificial intelligence, chatgpt, generative ai, ai, large language model, machine learning, intelligence, natural language processing, language model, artificial-intelligence, computational linguistics, chatbots, machine, model. It is also seen that the terms “education” and “information” are present, just as Braz and Alves (2024) showed in their work and Elias et al. (2023) highlighted the presence of and interest in GAI in the field of education and in ways to implement these tools in this field. However, this result does not show indicators for the health area, which demonstrates that both the health sector and studies focused on society are pursuing this implementation of GAI in the education of new professionals.

The results visualized so far corroborate the most cited works present in the textual corpus of this review, which can be viewed in more detail in Table 6, along with their authors, journal, title, discussion, and the total number of citations in their research.

Table 6

Authors, journal, title, Discussion, and total citations of the most cited articles from the corpus

Author/Journal	Title	Main Contribution/Discussion	Total Citations
Lim et al. (2023) / *The International Journal of Management Education*	Generative AI and the future of education: Ragnarök or reformation? A paradoxical perspective from management educators	GAI should be seen as a transformative tool in education, integrated into teaching in a way that promotes discussions about its ethical use and its implications.	271
Liu et al. (2023) / *Journal of Medical Internet Research*	Utility of ChatGPT in Clinical Practice	Support from ChatGPT in clinical practice for decision-making, efficient diagnoses, and providing pertinent information about diseases, but without underestimating the flaws that originate from artificial intelligence.	142
Wach et al. (2023) / *Entrepreneurial Business and Economics Review*	The dark side of generative artificial intelligence: A critical analysis of controversies and risks of ChatGPT	The need for regulation to combat risks associated with GAI, ensuring ethics and equity. It highlights the importance of continuous education for market adaptation and the reduction of technological inequalities.	92
Bin-Nashwan et al. (2023) / *Technology in Society*	Use of ChatGPT in academia: Academic integrity hangs in the balance	ChatGPT provides students with time savings, a reduction in stress and anxiety, and self-efficacy. However, due to ethical and legal concerns, its use has been limited, reducing the effects derived from ChatGPT, though it is still used for stress and anxiety reduction. Academics with strong integrity will use the tool more efficiently and for a longer duration.	61
Vartiainen & Tedre (2023) / *Digital Creativity*	Using artificial intelligence in craft education: crafting with text-to-image generative models	The exploration of educational AI with text-to-image generation, sparking students' creativity and democratizing access to visual resources. At the same time, it presents copyright problems and manifests a disconnection from the materiality of craftsmanship.	52

According to the most cited works, it is evident that there is a discussion in its initial phase about the contradictory effects present in GAI, and that it can present paradoxical consequences, with uses that bring, beyond the often-cited benefits, numerous consequences and risks to those who use the tools (Lim et al., 2023; Wach et al., 2023). In this sense, according to the data from this review, Lim et al. (2023) have the highest number of citations (271), followed by Liu et al. (2023), who discuss the use of GAI for decision-making in the medical environment and the contradictory consequences of this use, with a total of 142 citations in their study.

Also, corroborating the previously mentioned Zipf's Law, both Bin-Nashwan et al. (2023) and Vartiainen and Tedre (2023) highlight the risks present in the implementation and use of GAI in the field of education. That is, the authors argue that there is a negative counterpoint and that there are not only benefits to using these technologies, aligning with the thinking of Mick and Fournier (1998), who pointed out in their time the need to examine paradoxical perspectives for this type of phenomenon. This supports the authors who are seeking to implement a paradox view for the contradictory phenomena present in the use of GAI (Ferraro et al., 2024; Osadchaya et al., 2024), as well as those who indicate the possible existence of this reality (Berthon et al., 2024; Chen et al., 2024).

4.2. Categorization of the Corpus

Based on the reading of the studies that comprise the database, a categorization was performed according to the themes the works addressed. Thus, based on their similarities, the 166 studies analyzed were divided into five categories, to which each article is assigned to only one category. They are:

a) Positive points/opportunities and negative points/challenges of GAI

This category includes, among others, works that seek to highlight the qualities of GAI, predominantly addressing the challenges and opportunities that must be studied to properly insert the tool. In this sense, it was found that the majority of studies highlight how LLMs can be implemented in specific tasks to perform them more efficiently (Hu et al., 2023; Jo et al., 2023; Li et al., 2024; Lilley & Townley, 2024; Luitse & Denkena, 2021; Nouri et al., 2024; Roe & Perkins, 2023; Yamazaki et al., 2023).

On the other hand, some of the works in this category point to situations where GAI exhibits inconsistent performance and inaccuracies, which would compromise the proper execution of the designated activity (Ghafouri et al., 2023; Haupt et al., 2024; Hoque et al., 2024; Zhou & Zhang, 2024). This inconsistency and imprecision of GAI is negatively highlighted by works that report the limitations attributed to GAI, such that it is unable to correctly carry out certain activities (Ghafouri et al., 2023; Haupt et al., 2024; Hoque et al., 2024; Zhou & Zhang, 2024).

It should be noted that this was the category with the largest number of allocated studies, with 97 works that can be classified as praising GAI positively for insertion into a given space in society. This is noted because no studies were identified that highlight risks or negative points of GAI in the same way as the study by Wach et al. (2023), which portrays the points opposite to the benefits as a controversy and a consequence, making it clear that it is not something superficial that can be easily overcome. Only studies that adopt positive points, opportunities, and challenges were found, resulting in a more positive view of GAI.

According to the results of this review, which searched for works using words usually associated with paradoxes, it was possible to identify the same reality that Mick and Fournier (1998) encountered when they conducted their study. This finding, which aligns with the aforementioned authors, concerns a large number of works that only seek, superficially, to understand the positive and negative points related to the technology. As a consequence, this category was established to comprise works that only highlight the use of generative models positively or negatively, or that point to both in a superficial manner (Mick & Fournier, 1998).

Furthermore, it is observed that the works adopt the word "challenge" in relation to the act of instigating a problem to be accomplished or solved (Houaiss & Villar, 2021). This term has a positive connotation with respect to the negative points or those opposite to the benefits of GAI. This finding is based on the definition that a challenge is a problem

that requires personal effort, skill, and determination to overcome this "obstacle" (Cambridge, 2024; Curtis, 2015). This demonstrates the need for studies to seek an understanding of how to use GAI in a sustainable and long-term manner, taking into account both positive and negative points (Jarvenpaa & Lang, 2005; Lewis, 2000; Lewis, 2014; Mick & Fournier, 1998).

b) Controversies in comparisons between GAI and other technologies or individuals

The studies allocated to this category, totaling 12 works, seek to detail the differences between GAI compared to a person (Wang et al., 2024) in performing certain activities. Some of these works highlight excellent results from GAI (Cerame et al., 2024; Wang & Li, 2024), while others demonstrate that certain activities cannot be fully entrusted to intelligent technology (Ghosh et al., 2023; Kortemeyer, 2023; Marres et al., 2024). Beyond the comparisons between humans and technology, works were also identified that compare GAIs with other technologies, as well as comparisons between different types of LLMs (Agharia et al., 2024; Cerame et al., 2024; Terblanche, 2024).

Although the reviewed studies compare GAI to humans and other technologies, the identified controversies remain largely treated from a dichotomous perspective, neglecting the dialectical complexity inherent in organizational paradoxes (Lewis, 2000; Lewis, 2014; Mick & Fournier, 1998). This epistemological gap restricts the understanding of coexisting tensions and limits the formulation of adaptive and integrative strategies in the management of technological innovation. The findings of this review, therefore, reinforce the need to adopt a paradoxical approach in management, capable of guiding policies, adoption practices, and organizational transformation processes in the face of the emerging ambivalences of GAI. Corroborating this perspective, Ferraro et al. (2024) have already identified the paradoxes involved in the adoption of GAI-based chatbots, pointing to the disruptive nature of the technology, which requires not only structural innovations in organizations but also significant adaptations on the part of workers (Elias et al., 2023; Lim et al., 2023).

c) Paradoxes in Generative Artificial Intelligence

In this section, the definitions highlighted earlier in the theoretical background were taken into consideration, where a paradox is something contradictory, composed of opposing tensions—which exert ubiquitous and constant forces, both challenging and nurturing long-term success—or that technology is/does both X and not-X (Lewis, 2000; Lewis, 2014; Mick & Fournier, 1998). This perception is adopted since a considerable part of the analyzed works in the other categories highlights that when using a generative artificial intelligence to provide relevant information on a certain topic, the answers can be inaccurate and mistaken on multiple occasions (Zhou & Zhang, 2024; Hoque et al., 2024).

Thus, the studies classified in this section total 22 works and are related to the study's objective, which is to analyze the landscape of scientific production on paradoxes in Generative Artificial Intelligence, seeking to present a current overview of the studies. Thus, the studies in this category are distinguished by showing that many risks can manifest when using intelligent systems as auxiliary tools. However, the authors do not establish Generative Artificial Intelligence as something bad, but rather generate lines of reasoning that point to both positive and negative points (Stojanov, 2023; Bin-Nashwan et al., 2023; Hsu et al., 2024).

Thus, it was observed that the articles focused on paradoxes and controversies are found in the most diverse areas and view the phenomenon in distinct scenarios, such as in education, combating disinformation, and in the development of AIs themselves (Berlinski et al., 2024; Chen & Shu, 2024; Griffiths et al., 2024; Li & Zhang, 2024). In this sense, following the perspective of Mick and Fournier (1998), where a paradox occurs

simultaneously in the use of a technology and can be X and not-X at the same time, it was evident that these studies seek to reflect on a paradoxical reality in relation to GAI, even if indirectly. This was identified in the study by Thelot (2023), where he analyzed in his work a chatbot that underwent an unplanned anthropomorphization which, according to the author, led to logical failures on the part of the GAI after the phenomenon. Similarly, Roe and Perkins (2023) address, through a discourse analysis, what the British media reported about GAI, highlighting a paradoxical reality where much was promised regarding problem-solving, yet the authors denote an imminent danger that also surrounds this technology.

d) Repercussions in different contexts regarding GAI

When analyzing the works in the textual corpus, it was found that some publications (N=9) focused on analyzing how certain groups of individuals react to GAI/LLM tools (Park, 2024; Rutinowski et al., 2024; Ulnicane, 2024). Thus, it is noted that a considerable part of the works in this category is related to the perception that individuals have of the controversies in ChatGPT (Chen et al., 2024; Al-Khalifa et al., 2024; Pollard, 2024; Yu, 2024), given that this is the GAI tool that has gained the most prominence since its launch (OpenAI, 2022).

Regarding the repercussions that GAI has had in the most different fields, as has been addressed, there is a need for more studies that seek to explore this scenario from the perspective of paradoxes. Currently, what comes closest to this context is seen in the previously cited study by Roe and Perkins (2023), in which the authors denote inconsistencies in media discourse and the repercussion about GAI, where there are paradoxes related to the technology.

e) Works focused on the Medical Sector

The last of the categories concerns studies focused on the medical sector, where 26 works were identified. However, it should be noted that studies that have this research context, but address topics such as paradoxes or controversies of GAI were directed to the categories corresponding to those themes. Thus, this section highlights works that externalize the utilities of GAI in the medical sector, where challenges and opportunities are highlighted with a focus on the efficient implementation of these tools in the medical area (Xue et al., 2023; Schuppe et al., 2023). Again, it is noted that ChatGPT is the main tool listed in the works (Tomar et al., 2023; Li & Zheng, 2023).

Based on what is shown in the results regarding studies on GAI in the medical area, there is a need for studies on the topic to use the perspective of paradoxes. Because, as Lewis (2000; 2014) asserts, the use of this perspective goes beyond what the field is currently seeking to understand, aiming for sustainability and longevity, whether for the use of the technology or the task related to it. The search for this quality in use and in the task by the medical field is extremely important, given the complexity of the task involved, which could benefit from the adoption of paradoxes to analyze the task (Jarvenpaa & Lang, 2005; Mick & Fournier, 1998).

4.3. Future Research Agenda

Based on the discussions and results addressed in the present study, we seek to provide a research agenda with the most relevant and emerging themes identified. Thus, Table 7 presents in a structured way the gaps and their descriptions according to the categories identified in the study.

Table 7

Future Research Agenda

GAP	Description
Positive and Negative Aspects or Opportunities and Challenges of GAI	Regarding the opposing aspects, whether they are seen as positive and negative or as challenges and opportunities, and considering the novelty factor of GAI—see its launch in 2022 (OpenAI, 2022)—a moment similar to what Mick and Fournier (1998) witnessed when they sought to understand the landscape through a paradox perspective becomes evident. Therefore, this highlights the opportunity for studies that seek to implement these theoretical lenses to better explain the dynamics of GAI use, as well as for more in-depth studies on the results already expressed in works on the "opportunities and challenges of GAI."
Comparisons between GAI and other technologies or individuals	Regarding the comparisons made between GAI and other technologies, or even with human capabilities (Agharia et al., 2024; Cerame et al., 2024; Wang et al., 2024), a gap is noted where applying the paradox lens could support the understanding of more efficient and long-term ways of using the technology, aiming for durable and sustainable use (Lewis, 2000; Lewis, 2014).
Paradoxes of GAI	The observed gap concerning paradox studies aligns with the positive and negative points previously addressed, as studies using this perspective are still in a very early stage (Berlinski et al., 2024; Chen & Shu, 2024; Griffiths et al., 2024; Li & Zhang, 2024). In this sense, according to what was observed in the present study, there is a noted lack of studies that adopt the paradox perspective, given that opposing points occur in the use of this technology.
Repercussions in different contexts	The use of GAI in the most diverse areas has been debated since its launch (Elias et al., 2023); however, its repercussion in different contexts is proving to be an emerging topic (Park, 2024; Rutinowski et al., 2024; Ulnicane, 2024), and it focuses on the perception of ChatGPT use (Al-Khalifa et al., 2024; Chen et al., 2024; Pollard, 2024; Yu, 2024). Furthermore, regarding the use of paradoxes to understand the different perceptions of GAI, this reveals the possibility for more in-depth studies that seek to qualitatively understand the use of GAI in specific contexts.
Works focused on the Medical Sector	As discussed in the category related to works focused on the medical sector, the field presents a complex task that requires care regarding the adoption of new technologies and their consequences. Therefore, the implementation of a paradox perspective, which seeks sustainability and long-term use in the task, aligns with the nature of work in the health fields (Lewis 2000; Lewis, 2014). Additionally, there is an evident lack of more in-depth studies on the use of these tools, given that the majority of them focus only on identifying the accuracy in performing a task or not.

5. Conclusion

The present study aimed to analyze the landscape of scientific production on paradoxes in Generative Artificial Intelligence, seeking to present a current overview of the studies and enabling the proposal of a research agenda with new possibilities for study. To do so, an SLR was conducted according to the Tranfield et al. (2003) protocol, with the aim of advancing knowledge on the topic in a systematized way and providing insights for future research. In this sense, documents were searched on the Web of Science and Scopus platforms, obtaining a total of 166 papers.

With the help of the Bibliometrix tool, it was possible to map various characteristics of the publications, allowing for the perception of the papers' publication dates, as well as the most correlated keywords, in addition to identifying how many publications each author has, and the total number of authors, among other aspects (Donthu et al., 2021). This was a fundamental step for dividing the topic into categories and for the conclusions reached in the research.

During the discussion of the results, it was possible to identify that, even without setting a time limit for the database search, there was only 1 paper published in the years 2021 and 2022. This increased after the emergence of ChatGPT, when there was a large surge, rising to 52 publications in 2023 and 111 in the year 2024 (OpenAI, 2022). This result is due to the novelty factor of the technology and the popularity it gained after 2022 (Alqahtani et al., 2023; Bauer et al., 2023; Elias et al., 2023; Mohapatra et al., 2023).

Also, due to the novelty of the topic, 98.1% of the authors in the sample have only 1 published paper, which is reflected in the G and H-indices, where only Choi E and Ferrara E appear with a score of 2 for both indices, given their jointly published works (Choi & Ferrara, 2024a; 2024b). The results of Bradford's Law (1934) align with Zipf's Law (Hollingshead & Zipf, 1949) and the most cited works, in that there is a greater presence of the health and education fields, which corroborates Elias et al. (2023) on the impact this technology would have in these areas.

Among the most cited articles, it was observed that Lim et al. (2023) and Wach et al. (2023) were the works that proposed the effects of GAI on individuals and their fields in different ways. First, Lim et al. (2023) adopted the perspective of paradoxes and stressed that GAI would lead to a restructuring in the field of education or would end teaching as we currently see it. Meanwhile, Wach et al. (2023) treated the "challenges" of GAI, which are portrayed by other authors, as risks and controversies that must be taken into consideration when using the technology.

Subsequently, regarding the categorization of the database, five major categories were observed, which are divided into: Positive points/opportunities and negative points/challenges of GAI; Controversies in comparisons between GAI and other technologies or individuals; Paradoxes in Generative Artificial Intelligence; Repercussions in different contexts regarding GAI; and Works focused on the Medical Sector. Overall, the results made it possible to understand that the use of words that allude to paradoxes does not carry the connotation of this perspective. For the most part, the studies sought to address how the implementation of GAI can impact certain areas or what the opportunities and challenges are in adopting this technology (Ghafouri et al., 2023; Haupt et al., 2024; Hoque et al., 2024; Jo et al., 2023; Li et al., 2024; Nouri et al., 2024; Roe & Perkins, 2023; Zhou & Zhang, 2024).

Regarding the studies that applied the perspective of paradoxes, it is possible to observe a range of applications in different contexts, such as in education, in the development of GAI, in combating disinformation, and in the media discourse about the technology (Berlinski et al., 2024; Chen & Shu, 2024; Griffiths et al., 2024; Li & Zhang, 2024; Roe & Perkins, 2023). However, the landscape is focused on a superficial view of seeking to implement/use GAI and highlighting the favorable and negative points, just as Mick and Fournier (1998) pointed out in their study.

However, the limitations of the present study include the number of papers in open access, as the legal and monetary issues involved in conducting a systematic review that requires payment for access to numerous studies make the advancement of knowledge unfeasible. The study is also limited by the choice of keywords for data collection, as there is a vast range of semantic variations that can encompass the understanding of a paradox, thus making it difficult for the study to capture the totality of documents that address the topic.

However, as recommendations for future studies, a future research agenda was presented based on the five categories into which this study divided the works from the sample. Therefore, the topics addressed in the research agenda section are suggested, as is that future studies seek to encompass different views of GAI and deeper analyses of the positive and negative points or challenges and opportunities of the technology.

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