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Is ChatGPT an Ally or an Enemy? Its Impact on Society Based on a Systematic Literature Review

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ABSTRACT

The new AI based conversational chatbot, ChatGPT, launched in November 2022, is causing a stir. There are many opinions about this being a 'threat or a promise,' and thus it is important to understand what has been said about this tool and, based on the growing literature that has emerged on the subject, demystify its effective impact on society. To analyse this impact, a systematic literature review with the support of the preferred reporting items for systematic reviews and meta-analysis protocol was used. The data, scientific documents, were collected using the main scientific databases – SCOPUS and Web of Science – and the results were presented based on a bibliometric and thematic exploration of content. The main findings indicate that people are increasingly using this chatbot in more diverse areas. Therefore, this study contributes at the practical level, aiming to enlighten people in general – both in professional and personal life – about this tool and its impacts. Also, it contributes at the theoretical level, which involves expanding understanding and elucidation of the impacts of ChatGPT in different areas of study.

Keywords: new technology, ChatGPT, human factor, social impact, artificial intelligence

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1. INTRODUCTION

After the COVID-19 pandemic, the volatile, uncertain, complex, and ambiguous world that appeared after the cold war evolved into the brittle, anxious, non-linear, and incomprehensible (BANI) world, which suggests that the world is not linear, and that the only constant we have is change. The latest evidence of this is the emergence of new artificial intelligence (AI) technologies.

AI can be defined as the intelligence of machines and has been shown capable of reproducing actions compared to humans, once possessing some of the capacities of the human mind (*Cambridge dictionary*, as cited in Walter et al., 2022). AI tools hold the potential to enhance our existence and that of those we cater to; however, they are incapable of substituting the human exchanges that distinguish us from technological advancements (Cox & Tzoc, 2023).

As such, AI is a concept that has been in vogue recently, and the chatbot named ChatGPT has been the subject of many opinions and has generated a great deal of curiosity. This platform has had dramatic growth when compared with others, such as Facebook and Spotify, as they needed roughly ten and five months respectively to reach one million users, and ChatGPT only needed five days to reach the same number of users (Ahmed, 2023).

As mentioned above, AI has evolved in recent times, and recently, in November 2022, ChatGPT appeared, a tool developed by a non-profit company, OpenAI, based in the United States (San Francisco). This tool is freely available at https://openai.com.

ChatGPT is a powerful AI language model that uses deep learning techniques to generate human-like text responses to natural language inputs. It is a type of generative pretrained transformer (GPT) model, and it has been trained on a large corpus of text data to improve its ability to generate coherent and contextually relevant responses (Bhattacharya et al., 2023; Gupta et al., 2023; Halaweh, 2023; Johinke et al., 2023; Panda & Kaur, 2023).

ChatGPT is a tool that has emerged from natural language processing (NLP), which is an area of AI focusing on assisting computers in comprehending and generating human-readable text, thus allowing the chatbot to understand what was asked by the user and respond in a way as humanlike as possible (Lin et al., 2023; Vaishya et al., 2023). It is based on the GPT architecture, which uses neural networks to do the natural language process, enabling it to give a response in accordance with the content of input text (Sallam, 2023).

Although it is still in its early stages, ChatGPT is expected to have a significant impact on various areas, such as healthcare, education, research, and scientific writing (Alkaissi & McFarlane, 2023).

According to the literature, and with the use of the tool, it was found that it responds quickly to what is asked, using information available in books, articles, and websites in a general way. However, this information is limited to September 2021 and prior and the tool does not have access to relevant literature (Akhter & Cooper, 2023; Vaishya et al., 2023).

The history of ChatGPT can be traced back to 2018, when OpenAI first released a language model called GPT-1, an evolution of the NLP technology that was designed to generate humanlike text based on a given prompt or topic, with 5 GB of text.

Due to the success of GPT-1, OpenAI was inspired to develop even more advanced language models. In February 2019, they released GPT-2, which was trained on a larger dataset of over 40 GB of text. GPT-2 could generate remarkably coherent and natural-sounding text and perform language translation, and it quickly gained attention from researchers and enthusiasts in the AI community.

Following that, OpenAI released a third iteration of the model, GPT-3, in June 2020, which was even more advanced than its predecessors. GPT-3 was trained on an enormous dataset of approximately 45 TB of text, and it was capable of a wide range of natural language tasks, including code writing, article generation for news, mathematical addition, and much more.

ChatGPT was released by OpenAI on November 30, 2022, which is a variant of the GPT-3 AI chatbot specifically designed for use in chatbot applications. It is trained to act like a human being in understanding context and generating appropriate responses based on that context. This chatbot has the potential to recognize impossible, or even inappropriate questions and respond accordingly (Floridi, 2023; Short & Short, 2023; Taecharungroj, 2023; Tlili et al., 2023; Wang et al., 2023a).

ChatGPT, a recent milestone in AI, stands as a testament to the transformative capabilities of cutting-edge language models. A member of the GPT family, ChatGPT boasts an astonishing 175 billion parameters, making it one of the most expansive language models to date (Gilson et al., 2023; Wang et al., 2023b). This vast capacity enables ChatGPT to excel in understanding and generating natural language text (Zhang, 2023). Its foundation lies in the concept of deep learning, particularly leveraging the transformer architecture, which has revolutionized

 https://doi.org/10.1633/JISTaP.2024.12.2.6

the field of natural language processing (Hashana et al., 2023; Zhang, 2023). By pretraining on massive text datasets from the Internet, such as web pages, books, research articles, and other sources, ChatGPT acquires a profound semantic understanding, enabling it to generate coherent and contextually relevant responses (Dwivedi et al., 2023; Titus, 2024; Zhang, 2023).

The digital era has brought about a rapid evolution in technology, and the introduction of ChatGPT has the potential to greatly shape the future technological and digital landscape (Taecharungroj, 2023). Therefore, Elon Musk, cofounder of OpenAI, the company that developed ChatGPT, signed a letter in which the suspension of AI is proposed, to assess the danger it can bring. In this letter it is stated that AI systems which can compete with humans in intelligence can pose significant risks to society and humanity. Moreover, Sam Altman, who is the OpenAI CEO, said in an interview that AI is going to reshape society. Thus, there have been many comments expounding that AI tools should be aligned with human values (Tlili et al., 2023).

The digital age has unleashed an unprecedented expansion of intelligent technologies, among which ChatGPT has emerged as an intense focus of interest, given its versatile applications and the rapid rate at which it has achieved widespread adoption. However, while literature on its capabilities and applications proliferates, there is a discernible gap in the systematized understanding of its actual impact on society—especially from the human perspective. This study aims to bridge this gap, offering a critical and detailed analysis of the effects of ChatGPT on the social, economic, and cultural fabric.

Through meticulous analysis of the existing literature, we seek not only to map the implications of adopting this technology across various sectors but also to understand how it reconfigures human interactions, decision-making processes, and social values. Ultimately, by elucidating the multifaceted impact of ChatGPT, this work comes as a first analysis of the tool and what is already known about its impacts.

Papers related to ChatGPT are appearing in scientific databases at an increasingly rapid pace. However, most of them are not complete articles (more than 50% of the studies), demonstrating the importance of a systematization of concepts in terms of impact and clarification of the concept itself, to understand what is being said about ChatGPT. Furthermore, Taecharungroj (2023) states that it is important to study the impact of this technology on people's futures.

For all these reasons, a systematization was developed, for which a critical and exploratory analysis was carried out of what has been published, studying the trends of this theme. Thus, our work contributes to an initial exploration of this topic, ChatGPT and the human factor, trying to understand what is being said in the literature about the impacts of ChatGPT in society.

This study is structured as follows: Section 2 details the objectives we want to achieve with this study and describes the method used to answer them to achieve the main goal; Section 3 presents the results of the study; and Section 4 depicts the conclusions (final remarks, contributions and implications, limitations, and future work) regarding the field under analysis.

2. GOALS AND METHODS

2.1. Goals

The primary aim of this study was to examine how ChatGPT is affecting individuals, and to disseminate information to both the scientific community and the public about what has been discussed on this topic in the literature, to help people adapt as effectively as possible and try to mitigate the impact. Hence, the main goal of this study is to assess the impact of ChatGPT in society. With a view to ascertaining the answer, it was necessary to answer five other more specific/smaller objectives, stated below. The first three have the objective of understanding the characteristics of the selected studies from the two databases, while the remainder aim to comprehend precisely what is addressed in each of the works.

To better understand the reality that we wanted to investigate, we orientated our research towards identifying the main areas, countries, and authors that do the most work in this field. Therefore, the following guiding objectives were raised:

(1) Identify the most addressed areas in this field;
(2) Rank the most influential countries in this field;
(3) List the most recognised authors in this field.

With regard to a more detailed analysis of the literature on the very concept associated with ChatGPT and how it impacts society in terms of fields of action and people, the following guiding objectives were defined.

(4) Understand how it impacts on each area;
(5) Assessing the impact of ChatGPT on people, i.e. understanding the benefits and challenges of the tool.

2.2. Methods

With the aim of answering these objectives and reaching the main goal, a systematic literature review (SLR) was conducted, as it is a method that can be used for "identifying and critically appraising relevant research, as well as for collecting and analysing data from said research" (Snyder, 2019).

Therefore, this was the method chosen to understand how ChatGPT is currently impacting society, and Snyder (2019)'s approach was used in carrying out this study, starting from the design phase, then moving on to the conduction and analysis phase, and ending with the writing phase. PRISMA – preferred reporting items for systematic reviews and meta-analysis – methodology was used in the last phase according to the guidelines stated by Page et al. (2021). Fig. 1 shows a scheme of the methodology used and what was done in each phase.

In the design phase, we defined the research objectives guiding our study on "ChatGPT." The intention was to develop a comprehensive and general study on the topic, ensuring that no relevant work was omitted. To this end, the research objectives were carefully designed to align with the objectives of the study and provide a solid basis for the investigation.

During the conduction phase, we proceeded to search for studies in the SCOPUS and Web of Science (WoS) databases using the query "ChatGPT." The search was limited to the specific day of April 12, 2023, to capture the most recent studies up to that date. We used the PRISMA methodology to manage the selection of scientific studies, resulting in 279 documents, of which 50 were duplicates.

In the analysis phase, after excluding duplicates and applying the inclusion criteria (language, availability of full text, and type of document), we were left with 77 scientific studies for final analysis. Each of these studies was then subjected to a more detailed analysis to answer the specific research objectives, dividing the analysis into bibliometric analysis for the first objectives and a thematic exploration of content for the rest.

In the final writing phase, the information collected and analysed was synthesized into a coherent narrative. The writing went through several revisions to ensure clarity and precision, shaping the results of the research into a format suitable for publication.

Each of these phases is crucial to the development of systematic and well-founded research, and Fig. 1 serves as a visual representation of the study's methodological flow.

2.2.1. Data Collection

In the initial phase, a query needed to be stipulated to collect studies from the databases, SCOPUS and WoS. The query used was reduced to the concept "ChatGPT," to develop a general and broader study on this topic, not leaving behind any work that refers to this topic.

Given that this is an emerging concept, and that more and more people are talking about its implications in the most diverse areas, with comments on pros and cons, there are several studies being published in the databases every day. Therefore, it was necessary to close the search in the databases on a specific day, 12 April 2023, to start the analysis phase. PRISMA methodology was utilized to manage the selection of the scientific studies. On that date, 279 scientific documents (SD) were found in the databases, 184 from SCOPUS and 95 from WoS, of which 50 were duplicates in the databases. After removing these duplicates, 229 articles remained to select those which met the inclusion criteria:

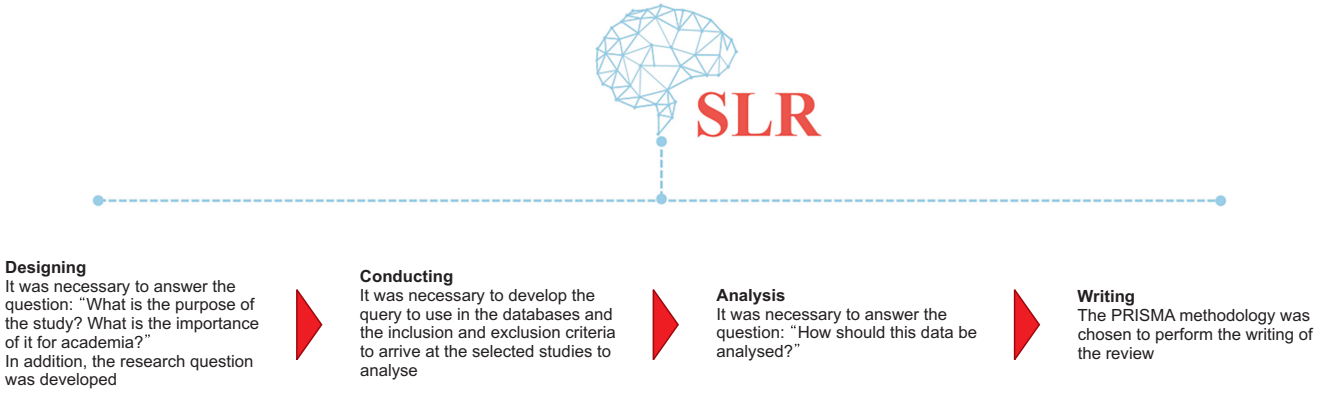

Fig. 1. Methodology used to conduct the study. SLR, systematic literature review; PRISMA, preferred reporting items for systematic reviews and meta-analysis.

 https://doi.org/10.1633/JISTaP.2024.12.2.6

- Language: English or Portuguese; due to our proficiency in both Portuguese and English, we chose to select articles in these two languages to ensure a more accessible and comprehensive analysis – two studies were excluded;
- Availability: full studies available for download – six studies were excluded;
- Document type: only complete studies, such as articles or review articles, were included, resulting in the exclusion of 144 studies, including notes, editorials, letters, errata, and short surveys.

With this screening, 152 SD were excluded, due to their failure to meet inclusion criteria (stated above), and with 77 SD being retained for final analysis. Of these 77 SD, none were excluded after reading the title and the abstract, in order to go deeper into their content. Fig. 2 schematises the procedure performed and described above.

2.2.2. Data Analysis

Fig. 1 illustrates the comprehensive study methodology. Within this methodology, the third part, which is the article analysis phase designed to extract information to address the research objectives, is comprised of two distinct types of study, each utilizing a unique approach.

The investigation's structure follows a dual approach. The first four specific objectives were explored through a meticulous bibliometric analysis. For objectives 4 and 5, a thematic exploration of content was conducted, where a thorough reading of the articles allowed for an in-depth understanding of the themes discussed.

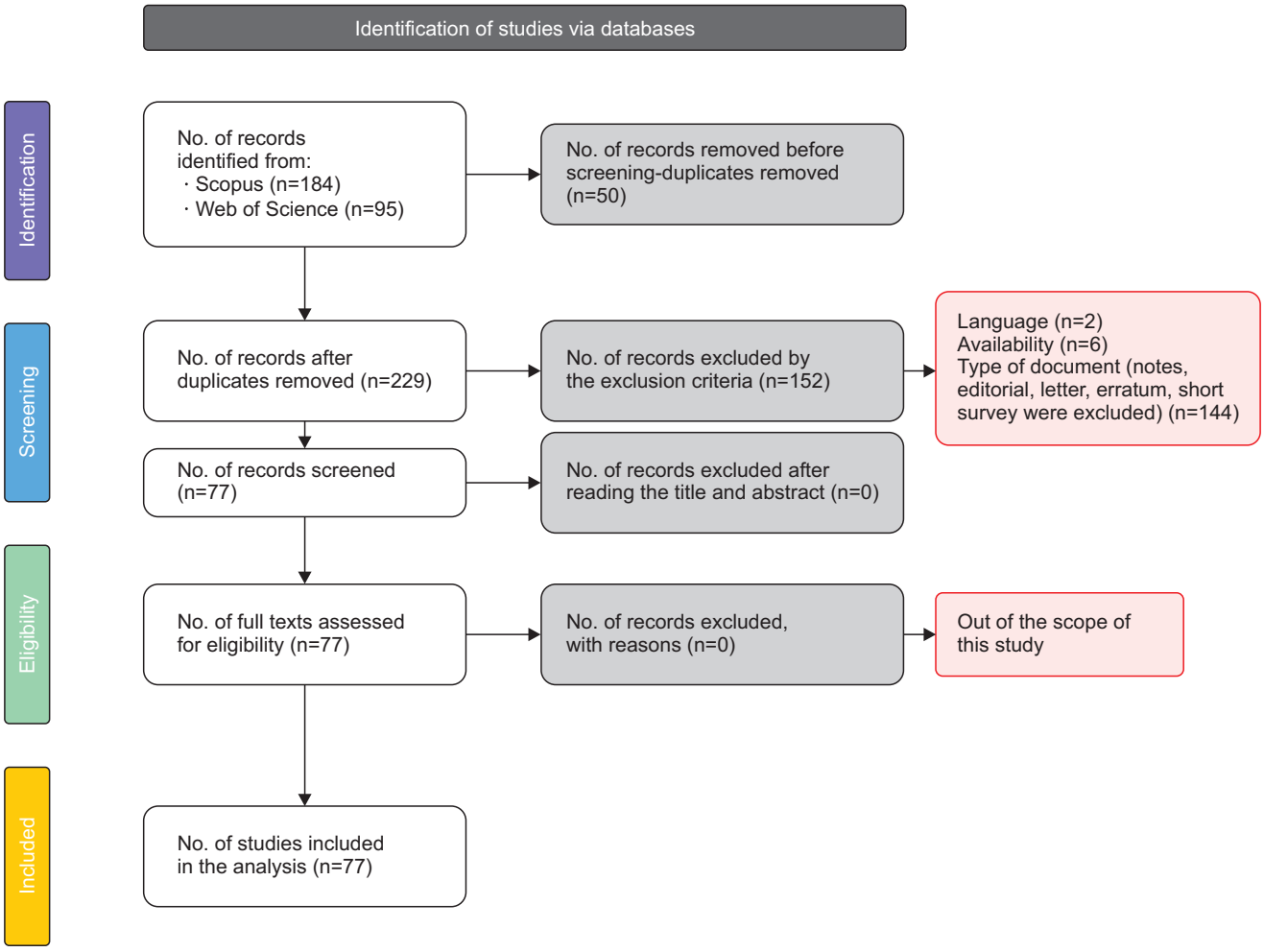

Fig. 2. PRISMA-based flowchart. PRISMA, preferred reporting items for systematic reviews and meta-analysis.

3. RESULTS AND DISCUSSION

This section is divided into two subsections: The first presents a bibliometric analysis and the second a thematic exploration of content. In each section, the results of these studies and some discussion of each topic can be found.

3.1. Bibliometric Analysis

This subsection presents the bibliometric analysis carried out to understand the reality we wanted to investigate. We orientated our research towards identifying the main areas, countries, and authors producing the most work in this field.

3.1.1. Analysis by Area

The literature presents studies of the various applications of ChatGPT in different domains, including health, education, and social, among others. The classification of studies into subject areas was based on the primary focus of the research. For instance, 'Education' encompasses studies primarily concerned with pedagogical processes, while 'Health/Medicine' includes research focused on clinical and health-related outcomes. 'Social' relates to studies on societal interactions and social structures, and 'Multidisciplinary' includes studies that integrate methods and theories from two or more academic fields. 'Others' comprises studies that do not align with the main categories. Fig. 3 shows the percentage of studies that addresses each of the abovementioned areas, with the majority addressing the theme of health and education, both with 27%. A considerable percentage (20%) refers to more than one area and can be considered multidisciplinary. It should be noted that the least addressed domain in the literature is the social, and it may be considered an emerging area of research. However, it is imperative to recognise that AI technology profoundly shapes our everyday experiences, and its influence weaves seamlessly through various domains and asserts itself as a fundamental force in all aspects of life.

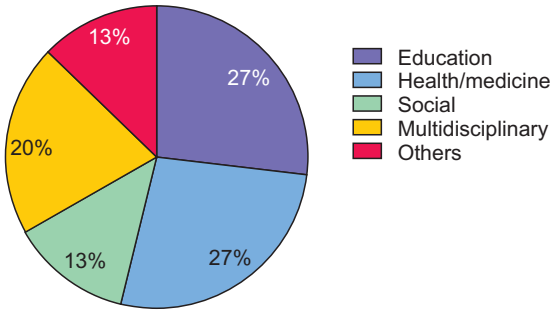

Fig. 3. Selected studies divided by areas, in percentage.

3.1.2. Analysis of the Geographical Distribution of the Papers

Fig. 4 offers a visual representation of the distribution of ChatGPT-related research, as gleaned from the analyzed papers, across 12 countries. Dominating the chart, the United States leads with an impressive count of 28 published articles. Fig. 4 is indicative of the country's robust research ecosystem and could be directly linked to its status as the home base of OpenAI, the entity behind ChatGPT. China and the United Kingdom follow with six and five publications, respectively, which suggests active engagement in the domain but also highlights a substantial gap in output compared to the United States. The graph's descending order illustrates the disparity in research contributions, which may reflect the varying levels of investment in AI technologies, and the concentration of academic and research institutions. It is important to consider that this chart also serves as a prompt for further inquiry into the factors that drive such disparities, including economic, educational, and policy differences among nations.

3.1.3. Analysis of Most Recognised Authors

Fig. 5, as visualized through the VOSviewer (Leiden University, South Holland, Netherlands) tool, demonstrates the authorship landscape in the realm of ChatGPT research. In our context, 'Recognised' refers to authors who are widely recognized for their contributions to the field, as evidenced by citations, peer recognition, and impact on the subject area. This term was used to encapsulate the esteem in which these authors are held within the

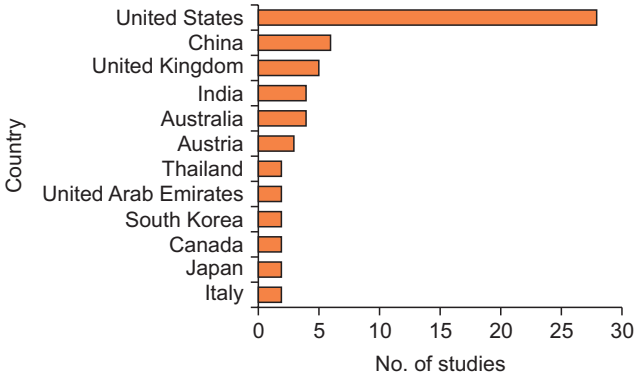

Fig. 4. Top 12 countries which contributed to the papers selected for this study.

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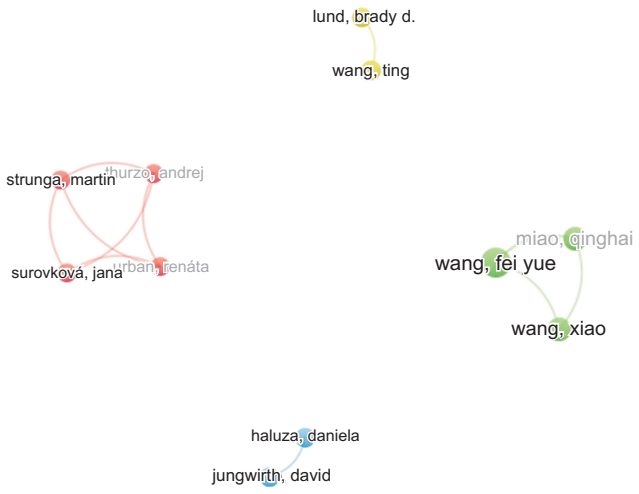

Fig. 5. Most recognised authors in the field (using VOSviewer).

academic community. The same definition applies to its usage in Fig. 5. The illustration divides authors into clusters by country, suggesting a tendency towards national collaboration within the field. The yellow cluster signifies the United States, green for China, blue for Austria, and red for Slovakia, each color representing a distinct research community. Notably, the clusters do not overlap, indicating that cross-country collaborations are currently limited or non-existent. This separation could reflect a variety of factors such as funding sources, institutional affiliations, or existing research networks. The absence of interlinking lines between clusters may point to potential opportunities for cross-border partnerships that could enrich the research through a diversity of perspectives. Furthermore, the size of the clusters may give insights into the relative volume of research output from each country, with larger clusters possibly representing a higher number of studies or a greater number of authors engaged in ChatGPT research. Understanding these dynamics is crucial for developing strategies to foster international cooperation and knowledge exchange in this rapidly evolving field.

Although ChatGPT is not among the selected "authors" with most studies, it appears in the SCOPUS and WoS databases as an author, being co-author in at least five studies. This information was obtained from the two databases mentioned. However, there are articles that argue that ChatGPT should not be considered an author since, as it is a search engine, albeit more sophisticated and advanced, it has no responsibility for what it writes (Lee, 2023; Sallam, 2023), while others refer to it only as a tool used to carry out the study (D'Amico et al., 2023; Macdonald et al., 2023).

3.2. Thematic Exploration of Content

This second subsection presents a thematic exploration of content in the literature to understand the concept associated with ChatGPT and its impact on society, in terms of fields of action and people.

3.2.1. ChatGPT and Its Impact in Each Area

The applications of ChatGPT are many, with future applications being all the ones we can imagine, and this has been increasingly researched over time (Du et al., 2023; Short & Short, 2023).

Emerging from the thematic exploration of content, the most prominent themes identify education and healthcare as key areas where ChatGPT exerts considerable influence. The selected papers, particularly evident in Fig. 3, underscore the significant impact that ChatGPT has had within these domains. This section, therefore, aims to expound on specific instances of ChatGPT's applications, detailing the scope and nature of its effect in both education and health.

3.2.1.1. Education.

Tlili et al. (2023) found in their study that "ChatGPT has the potential to revolutionize education in different ways." Evidence was found for at least two distinct approaches to the use of this chatbot in education, (1) scientific writing and academic publishing, and (2) education in general.

3.2.1.1.1. Scientific Writing and Academic Publishing.

Within education, one of the issues raised is scientific writing and the use of ChatGPT for this purpose. This is a concern as it may promote misinformation, as although the texts appear very credible, they may be nothing more than a compilation of truths with false information. This is called artificial hallucinations – when a chatbot generates seemingly realistic information that does not correspond to the truth (Alkaissi & McFarlane, 2023; Wang et al., 2023a).

Moreover, it is notable that the citations provided are not linked to any document/work, yet they appear linked to convincing text, which may end up misleading many people. Therefore, given that journals are not in the habit of checking citations one by one, it will be necessary to adopt policies and standards that control the use of this tool (Akhter & Cooper, 2023; Alkaissi & McFarlane, 2023; D'Amico et al., 2023; Lund et al., 2023; Manohar & Prasad,

2023).

Another issue that the use of ChatGPT raises is the issue of plagiarism, which is referred to by several authors as a concern (Sallam, 2023). Is it considered plagiarism when this tool is used in the preparation of scientific papers? Since plagiarism is defined as the use of ideas/texts from other people presented as the author's own, if the authors from which that information comes are cited, or it is even mentioned that the model was used in the preparation of that work, it should not be considered plagiarism (Cox & Tzoc, 2023; Halaweh, 2023; Lund et al., 2023).

Furthermore, the information that ChatGPT produces is highly dependent on the question asked of it, and it is possible to use it as a valuable tool that helps to produce the document and publish it in a faster way, helping to better express ideas. Also, it can promote equity between researchers that are not native English speakers since it can help to edit English texts. However, this information should be used critically, and not be accepted as absolute truth (Akhter & Cooper, 2023; D'Amico et al., 2023; Nachshon et al., 2023; Sallam, 2023).

As stated by Cox and Tzoc (2023), "In the future, AI tools may serve as research assistants, conducting virtual experiments, analyzing data, copywriting and editing text, and generating citations." This may make us think that it is a tool that can help with scientific writing, making it more productive (e.g. it can execute a rough draft of text, used as the insight for the study), but it would not replace humans in this task (Cox & Tzoc, 2023; Iskender, 2023).

For all these reasons, there are authors who argue that journals' policies and norms should be adopted now for publications to maintain their rigorous scientific standards. Furthermore, they propose clear identification of whether AI has been used to produce the work, and the use of a tool that evaluates if it has been used or not (Alkaissi & McFarlane, 2023; Cotton et al., 2023; Lund et al., 2023). Tlili et al. (2023) state that chatbots should be responsible for the information they provide, thus being aligned with human values and ethical questions.

3.2.1.1.2. Education in General.

Lin et al. (2023) suggest two kinds of uses for the chatbot ChatGPT in general education. On one hand, he reports that it can be used as a "learning companion," which helps the student to better understand what is studied. On the other hand, it can also help teachers to be more effective by playing the role of "simulated student." Thus, this technology can help teachers prepare materials, quizzes, lesson plans, syllabi, and much more, and can help the learning process of students, working as a tutor that supports them (Cox & Tzoc, 2023; Iskender, 2023; Tlili et al., 2023).

Despite having benefits, this technological tool, like all others, presents challenges, such as the fact that it can generate different answers with the same request prepared by different users, and the information provided by it should not be taken as 100% correct (Kung et al., 2023; Panda & Kaur, 2023; Tlili et al., 2023). Also, the use of this tool can lead to a non-development of important skills: critical and independent thinking, creativity, and problem-solving (Choi et al., 2023; Iskender, 2023). In this way, ChatGPT causes others to need digital and information literacy, so that students are taught by teachers to look critically at a text and understand whether it has been written by AI or a human (Cox & Tzoc, 2023).

There are entities that are embracing this new technology, but there are also others that are banning its use, as it allows students to "cheat" on their assignments (Tlili et al., 2023). However, Cox and Tzoc (2023) state that it will be necessary to make more complex assignments rather than making factual questions. Therefore, considering everything stated above, it is important for guidelines and policies to be defined to control and facilitate its use in schools and universities (Cotton et al., 2023; Halaweh, 2023; Tlili et al., 2023).

Moreover, teachers and students should seek to adapt and acquire skills so that they can adopt new teaching and learning philosophies in this new technological era (Crawford et al., 2023; Halaweh, 2023; Tlili et al., 2023). At no point will this tool be able to replace the teacher, mainly due to a lack of personalization and human interactions inside the classroom (Halaweh, 2023; Iskender, 2023).

Furthermore, fairness, accuracy, and equity should be ensured among students in using and accessing the tool, particularly for disadvantaged students and students with disabilities, among others, because at this point it is not accessible to everyone (Iskender, 2023; Tlili et al., 2023).

In terms of education, ChatGPT is both a harbinger of progress and a beacon of caution. Its potential as a learning enhancer and equaliser is clear, but it underlines the need to develop critical digital literacy among both students and educators. The tool's ability to serve as a 'learning companion' and 'simulated student' could revolutionise pedagogy and individual study habits, promoting accessibility and support in academic activities. However, the paradoxical nature of its impact – in which it can simultaneously foster and stifle critical thinking and creativity – calls for a differentiated and in-depth approach to its

integration into educational structures.

The varied impact of ChatGPT demands a conscientious balance: embracing its technological prowess to enhance teaching and learning, while guarding against inadvertently promoting intellectual complacency. The risk of dependency on automated knowledge requires an enhanced commitment to cultivating independent thinking and problem-solving skills in students. Furthermore, the dialogue around ChatGPT in education serves as a wake-up call for the formulation of proactive policies to guide its ethical use, ensuring fairness and equity, especially for those who may be digitally disadvantaged.

The conclusion drawn from the corpus of research is unequivocal: ChatGPT is not a panacea for educational challenges, nor a harbinger of academic obsolescence, but a fundamental tool for language learning.

3.2.1.2. The Field of Health/Medicine.

The other area most addressed in the literature when talking about the impacts of ChatGPT is health. Below, the information collected about the benefits and challenges that this model entails in this area is presented. As benefits of ChatGPT in health, within the selected papers, the following were found:

- It enables improved efficiency in healthcare, for example by rapid analysis of patient data (Bhattacharya et al., 2023; Budler et al., 2023; Haluza & Jungwirth, 2023; Jungwirth & Haluza, 2023; Sallam, 2023; Salvagno et al., 2023);
- It can help prepare literature reviews and access important and up-to-date information quickly, improving health literacy (Bhattacharya et al., 2023; Choi et al., 2023; Eysenbach, 2023; Khan et al., 2023; Sallam, 2023; Salvagno et al., 2023);
- It can free doctors and researchers in this area from repetitive tasks, such as transcription of medical records or diagnosis of patients, among others, saving time to put efforts into experiments and drug development, or even spend more time on patient care (Bhattacharya et al., 2023; Budler et al., 2023; Sallam, 2023);
- It helps in the preparation of documentation (D'Amico et al., 2023; Khan et al., 2023; Sallam, 2023);
- It may assist in the advancement of personalized medicine for each patient (Gilson et al., 2023; Sallam, 2023);
- It can help in decision-making for some treatments (Bhattacharya et al., 2023; Haluza & Jungwirth, 2023; Hirosawa et al., 2023; Khan et al., 2023; Sallam, 2023);
- It enables faster access to health care in emergencies – as it can be used to provide patients with information about their health – especially those patients from rural areas, without having to go to a physical location, and helps to alleviate pressure or demand on these spaces (Bhattacharya et al., 2023; D'Amico et al., 2023; Haluza & Jungwirth, 2023).

Although its adoption brings benefits for health, ChatGPT also brings challenges, among which the following ones were highlighted:

- As mentioned above, the information provided by ChatGPT may not be entirely true, so this could have serious consequences when talking about health (D'Amico et al., 2023; Sallam, 2023);
- Further, the lack of information about which data sources ChatGPT uses to provide the answers about health is a danger in this field (Sallam, 2023; Vaishya et al., 2023);
- Once again, as mentioned earlier, the lack of responsibility associated with the content provided by ChatGPT can be unfavourable when it responds wrongly to what was requested (Sallam, 2023);
- Both privacy and personal data security issues should be raised when using health AI tools (D'Amico et al., 2023; Eysenbach, 2023; Sallam, 2023);
- The tool shows a lack of personal and emotional perspective that is needed in health care delivery and shows that humans are irreplaceable in their skills and knowledge, at least for now due to the limitations of AI (D'Amico et al., 2023; Khan et al., 2023; Sallam, 2023).

Both the benefits and risks in using ChatGPT or integrating it into healthcare should be considered. However, as in other areas, the chatbots that are in vogue nowadays should not be ignored.

In the dynamic field of health and medicine, ChatGPT stands at the frontier of digital innovation, poised to redefine facets of healthcare delivery and medical research. Its capability to process vast datasets with speed and precision heralds a shift towards efficiency, where healthcare professionals can pivot from mundane tasks to focus on patient-centric care and innovative research. The implementation

of ChatGPT for rapid literature reviews, transcription of medical records, and aiding in diagnostics underlines the potential to enhance health literacy and access to healthcare, particularly in under-resourced regions.

Yet, with these advancements come critical challenges that necessitate rigorous scrutiny. The reliability of ChatGPT's medical information, the opacity of its data sources, and concerns over privacy and data security represent significant obstacles. The gravitas of health-related decisions amplifies the consequences of misinformation, making the tool's current limitations a matter of high stakes. Furthermore, the inability of ChatGPT to replicate the nuanced personal and emotional interactions fundamental to healthcare underscores the irreplaceable nature of the human touch in medicine.

As the healthcare sector considers the integration of ChatGPT, a balanced evaluation of its risks and benefits is essential. While AI's potential to advance personalized medicine and support clinical decision-making is promising, the exigency for transparent, ethical, and responsible use cannot be overstated. Policies that safeguard patient confidentiality and validate the accuracy of AI-generated information must be paramount. ChatGPT may offer a glimpse into the future of medicine—one where AI assists but does not supplant the human expertise, empathy, and ethical judgment that are the hallmarks of healthcare. The path forward is one of cautious optimism, advocating for a symbiotic relationship between AI and healthcare professionals to foster a future where technology complements the human elements of medicine, rather than competing with them.

3.2.2. ChatGPT and Its Impact on the Human Factor

3.2.2.1. Benefits and Opportunities of ChatGPT in the Human Factor.

Despite people feeling threatened by AI, it can raise the human dimension to another level. In Table 1 (Chen, 2023; Cox & Tzoc, 2023; Haluza & Jungwirth, 2023; Lin et al., 2023; Panda & Kaur, 2023; Taecharungroj, 2023) some of the benefits and opportunities that ChatGPT, an AI tool, brings to the human factor can be seen.

As can be seen in Table 1 (Chen, 2023; Cox & Tzoc, 2023; Haluza & Jungwirth, 2023; Lin et al., 2023; Panda & Kaur, 2023; Taecharungroj, 2023), ChatGPT emerges not only as a technological breakthrough, but also as a benefit for human inclusion and efficiency. Its potential to empower vulnerable populations underlines AI's role in reducing the accessibility gap, whether through helping people with disabilities or providing companionship to the elderly. The technology's ability to simplify processes stands out in high-demand environments, offering a scalability solution that human resources alone cannot match. For individuals in remote areas, ChatGPT acts as a digital

Table 1. What are the benefits and opportunities of ChatGPT in the human factor?

Benefit	Explanation	Sources
ChatGPT can help vulnerable people	ChatGPT can be used to provide information and services, and reduce loneliness in an accessible and efficient way for people with disabilities, including visual or hearing impairments, the elderly, and other vulnerable populations, thereby promoting inclusion	(Haluza & Jungwirth, 2023; Lin et al., 2023; Panda & Kaur, 2023; Taecharungroj, 2023)
ChatGPT can help to increase efficiency	It can help to develop multiple business processes and governments, since it can handle many requests simultaneously, making it an ideal solution for services that experience high volumes of customer and citizen interactions, providing efficient and effective communication with them, which can replace human customer services, reducing costs	(Haluza & Jungwirth, 2023; Taecharungroj, 2023)
ChatGPT can contribute to people from remote areas	Chatbots powered by AI are simplifying the process of obtaining information quickly and efficiently for individuals residing in remote regions with restricted access to healthcare providers, eliminating the need for hospital visits and long waiting times	(Haluza & Jungwirth, 2023; Panda & Kaur, 2023)
ChatGPT is an assistant that is ready 24/7	This gives us instantaneous and easy access to information and knowledge about a wide range of topics anywhere, anytime, and in multiple languages, without having to wait for someone to explain it or translate it	(Chen, 2023; Panda & Kaur, 2023; Taecharungroj, 2023)
ChatGPT can work along with other services	ChatGPT can be integrated with other tools or services (e.g. Microsoft and Google are going to integrate this AI tool)	(Cox & Tzoc, 2023; Panda & Kaur, 2023)

AI, artificial intelligence.

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lifeline, bringing services and expertise that geography would restrict. What is more, its omnipresence ensures that information and assistance are only a query away, at any time. The synergy between ChatGPT and services established by humans promises seamless integration into existing ecosystems, improving user experiences and operational efficiency.

3.2.2.2. Challenges of ChatGPT in the Human Factor.

Despite having so many benefits and opportunities in our lives, ChatGPT also presents challenges for the human factor (Table 2) (Cox & Tzoc, 2023; D'Amico et al., 2023; Dwivedi et al., 2023; Emenike & Emenike, 2023; Halaweh, 2023; Iskender, 2023; Khan et al., 2023; Nautiyal et al., 2023; Panda & Kaur, 2023; Sallam, 2023; Taecharungroj, 2023; Thurzo et al., 2023; Tlili et al., 2023).

In the landscape of AI advances, ChatGPT's impact on the human factor is twofold, affecting both the dynamics of human interaction and the framing of the more professional arena. As educators and healthcare professionals navigate the integration of this technology, the need for oversight of information accuracy and ethical considerations becomes paramount. It is essential to adapt the use of ChatGPT with a conscientious approach, ensuring that it complements human expertise without replacing the irreplaceable value of critical thinking and emotional intelligence.

It is crucial to ensure that ChatGPT and other technologies based on AI are developed and used in an ethical and inclusive manner, with transparency, equity, and fairness, to avoid reproducing prejudice and discrimination in society (Cox & Tzoc, 2023; Sallam, 2023; Taecharungroj, 2023).

The impacts of ChatGPT on the human factor are closely related to those specified in the fields of education and medicine. Both areas rely on people for their practical execution, and therefore, by impacting the field itself, it also impacts the people involved directly and indirectly. In the field of education, it affects both teachers and students, and in the field of healthcare, it affects both healthcare professionals and patients.

Table 2. What are the key challenges and societal impacts of implementing ChatGPT?

Challenge	Explanation	Sources
The information provided by ChatGPT can be true, or sometimes fake	ChatGPT may not always give totally correct information for our input. Since it is Internet-based, and knowing that not everything written there is true, we may be using false information as true, which in areas such as health can be critical in people's lives. ChatGPT might have harmful behaviours, such as dishonesty, manipulation, and misinformation Also, the information it provides is limited to the training data, which may lead to a lack of accuracy or irrelevant answers (a lack of knowledge to answer complex questions)	(Nautiyal et al., 2023; Panda & Kaur, 2023; Tlili et al., 2023)
ChatGPT can replace some jobs	ChatGPT and other innovative AI tools will affect a variety of jobs, from the most predictable (already expected to be replaced) to the least predictable (those previously taken for granted). As such, it is necessary to understand what implications this tool will have for the job market, and it is urgent to understand what skills and knowledge are needed for the next generation to succeed in a new era	(Iskender, 2023; Taecharungroj, 2023)
ChatGPT is not comparable to humans, regarding human capabilities	What distinguishes us as humans are our emotions, the social component, and motivation, among other characteristics. AI models only aspire to have these characteristics; however, although they are not there yet, they are taking steps daily towards what is called artificial general intelligence, which could have a particularly serious impact on humans	(D'Amico et al., 2023; Khan et al., 2023; Sallam, 2023; Taecharungroj, 2023)
The data given to ChatGPT is not secure	The issues of privacy, security, and reliability of personal data are another factor that needs to be explored when talking about the challenges of using ChatGPT	(D'Amico et al., 2023; Halaweh, 2023; Panda & Kaur, 2023; Thurzo et al., 2023)
The tool is not promoting equity and inclusion	It may raise questions about equity and inclusion in the use of the tool, e.g. due to the paid version being accessible only to those with funds to use it, and the fact that the tool works better in English than in other languages	(Cox & Tzoc, 2023; Dwivedi et al., 2023; Emenike & Emenike, 2023; Nautiyal et al., 2023)

AI, artificial intelligence.

4. CONCLUSIONS

4.1. Final Remarks

At the time of the launch and availability of this online tool there were questions, such as: "How did people from OpenAI think the benefits of using ChatGPT and making it available for everyone who has access to the Internet would outweigh its risks?" This work tries to understand the impact that this tool is having in society and thus contributes to coming closer to the answer to this question.

As stated earlier, the only constant in the world is change, and the impact of this whole new paradigm of ChatGPT and AI technologies and its integration into our lives are very uncertain. So, as stated by Taecharungroj (2023), it is important for people to constantly adapt and be flexible to change, and not try to run away from it, to get as much benefit as possible from these new technologies. Therefore, people need to start looking at technology as an ally and not as a threat. By way of example, Microsoft and Google are two companies that will not ignore the tool that is already replacing some of its uses, and will even integrate ChatGPT in the coming months, which leads us to conclude that everything and everyone should pay attention to the impacts of these tools and try to mitigate them (Cox & Tzoc, 2023).

As mentioned above, the most productive country in this field is the USA, followed by China. There is at least one other language model based on the GPT architecture, Wu Dao, which was developed in China, and which is significantly larger than the original ChatGPT version. Perhaps this could be the reason why China is the second country with the most articles among those selected. Moreover, three of the authors with the most articles in this area are affiliated with the university where the software was developed, the Beijing Academy of Artificial Intelligence.

According to the bibliometric analysis carried out on the 77 articles, it can be concluded that the main areas where the impacts are discussed are education and medicine, which were exactly those that were investigated in the thematic exploration of content throughout this study.

One the one hand, regarding education, in terms of scientific writing and publishing, we found evidence that ChatGPT is indeed a tool that allows generation of text in a clear, fast, and comprehensive manner, which suggests its use in the writing of academic literature. However, it falls somewhat short of what is required of it, since the information it generates is not reliable enough for publication. Therefore, the use of this tool should be discouraged, as it can promote misinformation, both by providing false information and by using non-existent citations (Manohar & Prasad, 2023). It should be used critically and only as an auxiliary tool, since it is a tool that helps and accelerates the part of writing a manuscript (Akhter & Cooper, 2023). On the other hand, regarding education in general, the challenge proposed by some articles is how conversational chatbots can adjust the way they behave and respond in a customized way, according to the human features it is dealing with (Lin et al., 2023).

Regarding healthcare, these chatbots can be a good alternative/help to aid in relieving the health system, answering some questions and providing some information to the patients, alleviating their anxiety and clearing their doubts, reducing the need for visits to the physical space (hospital), and making room for those who really need more specialized and personalized help (Budler et al., 2023; D'Amico et al., 2023).

Sallam (2023) also investigated the benefits and challenges of ChatGPT in the areas covered in this study. However, our research target (databases) is different from those used by this author. Also, Du et al. (2023) and Gao et al. (2023) address another distinct application of ChatGPT, which is its application in areas such as autonomous driving, human and vehicle interaction, and intelligent transportation systems, pointing out that this approach brings many challenges, including the privacy and security of sensitive passenger data and ensuring that the chatbot provides truthful information, to promote trust between the vehicle and its passengers.

Therefore, and as previously mentioned, many authors argue that standards and guidelines are needed to enable responsible and controlled use of AI tools and reconstruct study and research programmes to better integrate them (Nautiyal et al., 2023; Sallam, 2023). Thus, if the tool is used responsibly and according to specific standards, ChatGPT can be a valuable aid in the advancement of medicine and education, while also helping to overcome language barriers (Lund et al., 2023; Sallam, 2023).

One of the challenges pointed out about ChatGPT regarding the human factor is that of equity, inclusion, and fairness about the use of these tools by everyone. Therefore, there are authors who argue that it is a matter of time before this tool starts to be paid for, and therefore will further promote inequity (Dwivedi et al., 2023).

As the world continues to grapple with the BANI landscape, marked by its brittleness, anxiety, non-linearity, and incomprehensibility, the rapid ascent of ChatGPT has not only garnered intense curiosity but also ignited important

conversations about the role of AI in our society. This remarkable AI tool, with its exponential user adoption rate, symbolizes a pivotal moment in our digital evolution, prompting leaders like Elon Musk and Sam Altman to voice their concerns about its implications for humanity. With a surging number of papers and studies focusing on ChatGPT, there is a pressing need for a comprehensive understanding of its impact, potential dangers, and benefits. This study seeks to address these issues, shedding light on the significance of ChatGPT in shaping the ever-evolving landscape of human interaction and technology.

Moreover, it should be noted that, just as the use of calculators, computers, and the Internet, among other technologies, was doubted in the past, today we are facing a new paradigm of technology, and what we doubted before are now mechanisms aiding our daily lives. Thus, the inclusion of ChatGPT in the most diverse areas, even if in a considered way, will allow a better understanding of what is not only its potential, but also its limitations, and can contribute to adapting these same areas to the reality in which we live in the twenty-first century. In conclusion, for all the reasons stated above, ChatGPT and AI tools have the potential to elevate the human dimension to another level.

The bibliometric analysis reveals a focused integration of ChatGPT in health and education sectors, signaling an active pursuit to leverage AI in areas critical for societal advancement. With the United States leading in the

Table 3. Data synthesis of the study

Bibliometric analysis	Thematic exploration of content
Analysis by area • ChatGPT applications are diverse, with a focus on health and education (both at 27%) • A significant portion (20%) addresses multiple areas, reflecting multidisciplinary research • Social applications of ChatGPT are less explored but can be considered an emerging field	ChatGPT and education • ChatGPT's role in education includes scientific writing, academic publishing, and general learning assistance • Concerns include the potential for misinformation, plagiarism, and dependence on ChatGPT's generated content • While ChatGPT can aid in research tasks, it should be used critically, and policies are needed to ensure rigorous scientific standards • ChatGPT is used in education to enhance scientific writing and serve as a 'learning companion.' However, concerns about plagiarism and overreliance on the tool have been raised. It may assist in various educational tasks but should not replace human input entirely
Analysis of geographical distribution • The United States is the most prolific country in ChatGPT research, with 28 articles • China follows with six articles, and the United Kingdom with five articles	ChatGPT and healthcare/medicine • ChatGPT offers benefits such as improved efficiency in healthcare, literature review assistance, and time savings for healthcare professionals • Challenges include the potential for incorrect information, transparency of data sources, privacy, and the lack of a personal and emotional perspective • The benefits and risks of integrating ChatGPT into healthcare should be carefully considered
Analysis of most recognised authors • Authors are grouped into clusters by country, indicating collaboration within their respective regions • Some authors debate whether ChatGPT should be considered an author, as it is a tool rather than a contributor to research	ChatGPT and the human factor • ChatGPT has the potential to enhance the human dimension, offering numerous benefits and opportunities • ChatGPT offers benefits such as assisting vulnerable populations, increasing efficiency, and being available 24/7 • Challenges involve ethical and inclusive development, transparency, and addressing biases to avoid discrimination in society • Challenges include the accuracy of information, potential job displacement, and the limitations of artificial intelligence compared to human capabilities. Ensuring privacy, security, and equity is crucial
Overall impact • ChatGPT's influence extends beyond individual fields, affecting the professionals and people involved • It presents both opportunities and challenges in various domains, emphasizing the importance of ethical and inclusive use	

number of publications, this points to a strong AI research ecosystem potentially driven by the presence of OpenAI, indicating regional influences on technological adoption. The clustering of authors by country, as shown by the VOSviewer, suggests a predominance of national collaboration and highlights a gap in international research partnerships, presenting an opportunity for a more global exchange of ideas and knowledge in AI.

The thematic exploration of literature content in ChatGPT underscores its pivotal role in redefining educational and healthcare landscapes. Its deep learning foundations and GPT architecture empower it to process language in a way that closely mirrors human interaction, positioning it as an innovative tool that could reshape pedagogical and clinical practices. In education, it offers a promise of augmented learning experiences, while in healthcare, it could influence both clinical decision-making and patient interactions. This transformative potential, however, comes with the responsibility to address the ethical dimensions of AI deployment, ensuring that its integration supports human expertise without compromising ethical standards or exacerbating inequalities.

Overall, these analyses situate ChatGPT at the intersection of technological innovation and human-centric application, emphasizing the need for a thoughtful and ethical integration of AI in pivotal societal sectors.

In summary, our analysis delves into the multifaceted influence of ChatGPT, spanning fields as diverse as education, healthcare, and the broader human factor. As the human dimension evolves alongside AI technologies like ChatGPT, our findings emphasize the critical importance of responsible integration, transparency, and the mitigation of biases in our society. Table 3 presents the data synthesis of the study, highlighting the main outcomes.

4.2. Contributions and Implications

Given the exponential growth in studies related to ChatGPT, there is a need for research that systematizes the concepts in terms of impact and clarification of the concept itself. Thus, a SLR was conducted with the aim of assessing the impact of ChatGPT in society, by means of which it can be concluded that people are surprised and scared at the same time with the appearance of this tool.

As a result, this study features at least two contributions, which can help both academia – with a theoretical contribution – and practitioners – with practical contributions:

(1) Theoretical - this involves expanding understanding and elucidation of the impacts of ChatGPT in different areas of study, and also clarification of the concept itself;

(2) Practical – this aims to inform people in general (both in professional and personal life) about the benefits of the tool and warning about the dangers, leading them to a more prudent use of it.

4.3. Limitations and Future Work

Despite these two contributions, this work has some limitations. On one hand, the contributions are based only on secondary data sources, scientific articles; and on the other hand, since the tool has recently appeared, and given the growth in the number of studies published daily (which showed the need for systematization), the review had to be done over a short period of time. Due to the novelty of this tool, ChatGPT, it is normal that first studies end up raising several questions and prompting future works, more than providing detailed answers for those questions.

For further investigations, the plan is to follow the trends of the topic (ChatGPT and its impacts), with a systematization of works, due to the number of studies being published daily. Furthermore, it was found that there is a need to carry out awareness raising actions on the impact of ChatGPT, to avoid fears and mistrust within the main fields. Moreover, there is a need for regulation at the beginning of the use of ChatGPT, since this type of AI tool is becoming almost indispensable nowadays, and with the passage of time, to avoid the inappropriate use of it. Then, the undertaking of a work with guidelines about the tool itself, and how it should be used should be proposed. Also, although ChatGPT is a helpful tool, people look on it as a threat, and so in order to counteract this, the development of mechanisms is proposed that would allow people to start taking a different perspective on AI. Finally, after widespread use of the tool, it would be interesting to understand its impact on users by resorting to primary data sources (i.e. talking directly with them).

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CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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