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Artificial Intelligence in Organisation and Managerial Studies: A Computational Literature Review

Completed Research Paper

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Abstract

The goal of this paper is to develop a complete overview of the current debate on artificial intelligence in organisation and managerial studies. To this end, we adopted the Computational Literature Review (CLR) method to conduct an impact and a topic modelling analysis of the relevant literature, using the Latent Dirichlet Allocation (LDA) technique. As a result, we identified 15 topics concerning the artificial intelligence debate in organisation studies, providing a detailed description of each of them and identifying which one is declining, stable or emerging. We also recognized two main branches of research regarding technical and societal aspects, where the latter is becoming increasingly important in recent years. Finally, focusing on the emerging topics, we proposed a set of guiding questions that might foster future research directions. This paper provides insights to scholars and managers interested in AI and could be used also as guide to perform CLR.

Keywords: Artificial Intelligence, Machine Learning, Computational Literature Review, Latent Dirichlet Allocation

Introduction

Artificial Intelligence (AI) is defined as “a system’s ability to interpret external data correctly, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation” (Kaplan and Haenlein 2019). AI can therefore be designed, developed and embedded in a multitude of technologies (Zhu et al. 2021). AI applications are classified by comparing the cognitive capabilities of machines with those of humans. Currently, the applications used are defined as Artificial Narrow Intelligence (ANI), in which case the machine is able to replicate a task in a similar way to that of the human brain (e.g. Machine Learning). However, there are two further steps, namely Artificial General Intelligence (AGI) and Artificial Superintelligence (ASI) where the machine respectively equals and exceeds human capabilities (Zhu et al. 2021). The transition to more advanced forms of AI poses many challenges from a technological, organisational, and societal perspective. It is therefore of paramount importance to study the impact of these new technologies and the possible implications of their adoption (ibid).

AI is among the most relevant topics of the last decade and is reshaping human interaction in various domains, from everyday tasks to working life (Makarius et al. 2020). Especially from an organisational perspective, AI is being implemented for the automation of many processes within companies (ibid). Bhaskar Ghosh et al. (2019) state that about 80% of companies have adopted AI technology in their core business, with a 70% increase in five years. The outcome of this broad implementation of new technologies based on AI algorithms are manifold. On the one hand, many companies are actually experiencing a technological revolution, by exploiting the growing computational capacity of devices (Schwab 2016)

together with the advantages of new technologies, they are reaching levels of efficiency that were unimaginable just a few years ago. On the other hand, the implementation of AI technologies and their adoption often lead to some forms of resistance from employees and managers (Glikson and Woolley 2020; Huang and Rust 2018). In fact, AI is perceived by many as a possible replacement for their work, especially when applied to solving analytical and communication tasks. In these cases, although AI is a continuous source of innovation, it could have many effects on human employment and human behaviour (ibid.). According to Makarius et al. (2020), AI is profoundly changing the world of work. Moreover, due to the recent COVID-19 pandemic, companies have accelerated their AI adoption plans¹. As a result, there is a need for more research investigating the effects of adopting various AI solutions in many fields of business organisation.

Since the introduction of these new technologies, studies on the use of AI have increased significantly, especially in recent years, fostering new theories and opening up new questions (Makarius et al. 2020). Although in the organisational sphere technology has been considered as one of the fundamental factors in shaping the forms of organisation and its functions, the number of studies investigating the impact of new technologies on organisational processes has declined over time, at least until the advent of the Industrial Revolution 4.0. In fact, starting less than a decade ago, the interest of scholars on such issues has increased, along with the interest in investigating issues related to new AI-based technologies within organisational environments (Bailey et al. 2019).

In light of these findings, we believe that it may be of interest to map and evaluate the existing literature (Tranfield et al. 2003) on how the AI debate has been developed in organisational and managerial studies, in order to identify new issues and research gaps that may lead to future studies. Given the large number of scientific articles related to the topic of interest, among several possible literature review approaches we decided to perform a Computational Literature Review (CLR). The rationale behind this choice was dictated by the need to qualitatively analyse items in a large dataset. This method therefore seems to be more appropriate than others, such as bibliometric analysis, which instead uses a quantitative approach to describe, evaluate and monitor published research (Lamboglia et al. 2020). Furthermore, even though other literature review methods are supported by software, CLR goes further by using text mining and Machine Learning (ML) algorithms to examine the content of the article and allowing the machine to automatically perform time-consuming tasks. The next section provides further details on the methodology and research protocol. The presentation of the results with their implications and discussion closes the contribution.

Theoretical Background: AI Literature Review

Since the studies concerning AI have increased exponentially in recent years, it is not surprising that systematic literature review (Borges et al. 2021; Grover et al. 2022; Kitsios and Kamariotou 2021; Toorajipour et al. 2021; Trunk et al. 2020; Zuiderwijk et al. 2021) and especially bibliometric analysis (Dhamija and Bag 2020; Reis et al. 2019; Verma et al. 2021) are widely used as review methods. Interestingly, the papers cover a broad range of topics, indicating that AI, inside the organisational setting, is being applied in different areas for different purposes.

Dhamija and Bag (2020), conducted a bibliometric analysis on 1854 articles on AI in operations management. Through a network analysis they discovered the presence of 6 clusters on the predominant topic in the AI field. Another bibliometric analysis in conjunction with intellectual network analysis was carried out on 1580 articles from 1982 to 2020 to review the literature on marketing (Verma et al. 2021). Trunk et al. (2020) conducted a systematic literature review on 55 articles and built a conceptual model explaining how AI can be used for strategic decision making. Moreover, the authors discover that, to successfully use AI technology, human decision makers have to become interpreters of the results of the machine and not only supervisors of predefined processes. Using the same review method, Kitsios and Kamariotou (2021) provided a research agenda about AI and ML in organisational strategy and decision making processes. Grover et al. (2022) combined literature review with social media analysis to study the effect of AI on operations management. Thanks to this hybrid research they were able to find different insights in both fields of analysis. Another systematic literature review was performed on 41 articles to

¹ Joe McKendrick (2021), AI Adoption Skyrocketed Over the Last 18 Months, Harvard Business Review. Available at: <https://hbr.org/2021/09/ai-adoption-skyrocketed-over-the-last-18-months>

provide a review of the state-of-the-art literature on AI in organisational strategy. Particular attention was given to Decision Support System (DSS), customer and employee engagement, automation and new products and service offering (Borges et al. 2021). Toorajipour et al. (2021) analysed 64 articles to review the use of AI in Supply Chain Management (SCM). They found interesting results regarding the most used AI techniques in SCM and also the SCM subfield that could have the highest potential if enhanced by AI. A further important topic is represented by public sector. Two literature reviews explore how AI is impacting government and policy makers by exploring risks, implication and opportunities (Reis et al. 2019; Zuiderwijk et al. 2021).

Article	Methodology	Focus	Findings
Dhamija and Bag (2020)	Bibliometric Literature Review (Network analysis) 1854 articles published between 2018 - 2019	Review AI and related domains in combination with operation management	Identified six clusters that focus on predominant themes for present and future research
Verma et al. (2021)	Bibliometric Literature Review (Co-citation and Co-occurrence analysis) 1580 articles published between 1982 - 2020	Review of AI inside marketing sector	Identified most relevant sources and researchers in the field, along with relevant topic and future research directions
Trunk et al. (2020)	Systematic Literature Review and Content Analysis 55 articles published between 2016 and 2020	Review of adoption of AI for decision making under uncertainty	Identified a conceptual framework for AI adoption inside the organisational processes for decision making under uncertainty.
Kitsios and Kamariotou (2021)	Systematic Literature Review 81 articles published before 2020	Review of the correlation between AI and corporate strategy	Identified four sources of value creation concerning the use of AI in business strategy along with gaps for future researches
Grover et al. (2022)	Systematic Literature Review and Social Network Analytics 181 articles published between 2010 and 2019 combined with Twitter data	Review of the use of AI in operation management	Identified a framework for AI implementation inside organisations and best practices of AI tools adoption inside operation management
Borges et al. (2021)	Systematic Literature Review 41 articles published between 2009 - 2020	Review of the integration of AI to organisational strategy	Identified four sources of value creation concerning AI inside organisational processes along with gaps for future researches for each of the sources
Toorajipour et al. (2021)	Systematic Literature Review 64 articles published between 2008 - 2018	Review of AI inside Supply Chain Management	Identified AI techniques and applications that can contribute to Supply Chain Management development
Reis et al. (2019)	Bibliometric Literature Review and Content Analysis 74 articles published before 2018	Review of AI in government services: analysis of countries spending on AI	Identified areas of research concerning the use of AI in the public sector and EU - USA policies comparison
Zuiderwijk et al. (2021)	Systematic Literature Review 26 articles published between 2010 - 2020	Review of the implication of the use of AI inside Public Governance	Developed a research agenda on the implementation and use strategies of AI inside public governance and on the risks of AI use inside public sector

Table 1. Literature review comparison

Table 1 summarizes the methodology (bibliometric vs systematic), the focus, and the findings of recent literature reviews on AI. Specifically, bibliometric literature review could be considered as a quantitative approach, analysing many articles, while systematic literature review adopts a mainly qualitative approach by examining a small set of articles. Indeed, due to the difficulty to qualitatively revise a large number of contributions, the systematic literature reviews mentioned previously have used a restricted pool of articles that rarely exceed 100 articles (Grover et al. 2022). With a CLR we want to go further and try to qualitatively investigate a large sample of articles to provide a timely and insightful analysis on the current literature on AI in organisational settings. Further details in the CLR method are provided in the following subsection.

Computational Literature Review

In recent years, there has been a proliferation of new journals and conferences leading to an exponential increase in the existing literature (Mortenson and Vidgen 2016). Furthermore, due to this growth in literature, scholars are relying heavily on literature reviews to inspect a particular research field (Badger et al. 2000). The increasing complexity and breadth of the scientific literature, along with the growing importance of unbiased reviews, has led to the need for systematic and easily replicable literature reviews (Antons et al. 2021). Systematic Literature Review (SLR) is conducted using a systematic, rigorous and easily reproducible standard (Okoli and Schabram 2010), and this method is preferred to analyse today's extensive literature (Rowe 2014) and to avoid any bias in article selection, that is arbitrary in "Non Systematic" reviews (Martin Kunc, 2018). However, the difficulty of conducting this type of research has increased significantly, with many researchers becoming discouraged by the time and effort required for such analyses and opting to focus on empirical studies (Mortenson and Vidgen 2016). These problems have made it necessary to adopt new methods that allow the best practices of systematic literature review to be combined with computational methods (Antons et al. 2021) that would, on the one hand, speed up content analysis and, on the other hand, broaden the scope of reviews by identifying and extracting knowledge that would be precluded by manual analysis (Boyd-Graber et al. 2017). One method that enables researchers to analyse large volumes of documents in a rigorous and timely manner is CLR. defined as:

"A structured process intended to augment human researchers' information processing capabilities through the use of machine learning algorithms that help analyse the content of a comprehensive text corpus in a specific knowledge domain (e.g., a research topic, academic journal, or scientific field) in a way that is scalable and real-time capable." Antons et al. (2021)

CLR allows to automatically analyse a dataset by identifying themes through topic modelling. It is sometimes referred to as non-linear principal component analysis because it finds latent components (called topics) that can explain variance in the data (Hindle et al. 2020). Topic models are algorithms capable of discovering themes within a large number of unstructured documents by analysing the connections between words contained therein (Blei, 2012). An example of a topic model is Latent Dirichlet Allocation (LDA), a probabilistic generative model for the collection and analysis of unstructured data. LDA is applied to find topics within a text on the basis of links between words and then classify texts according to the relevance of the topics found within them (Blei et al. 2003).

A CLR can be performed using the guidelines provided by Antons et al. (2021), where they describe a six-step process analysis:

- **Define a conceptual goal** that motivates the review.
- **Operationalise the CLR** by defining the boundaries that are going to be inspected.
- **Choose a computational technique** that best suites the conceptual goal.
- **Perform content analysis** by preparing the data and deploying the computational technique.
- **Generate original insights** by observing the results provided by the computational analysis
- **Present the findings** in a clear and accessible way.

In this paper we use the guidelines as a baseline to develop the "Figure 1" framework we adopted to run our CLR.

Research Method

The main purpose of this contribution, and thus our conceptual goal, is to explore and summarise the debate on AI in organisation and managerial studies. Hence, it was quite relevant to operationalise our literature review by identifying the appropriate list of journals on which to perform the query in order to select the papers to create our dataset. The Academic Journal Guide (AJG) (<https://charteredabs.org/academic-journal-guide-2021/>) of the Association of Business Schools (ABS) provides a list of journals classified according to the field of studies to which they belong and their ranking. With regard to the fields, we considered those belonging to the organisational sphere, such as: “Entrepreneurship and Small Business Management” (ENT-SBM), “General Management, Ethics, Gender and Social Responsibility” (ETHICS-CSR-MAN), “Human Resource Management and Employment Studies” (HRM&EMP), “Information Management” (INFO MAN), “Innovation” (INNOV), “Management Development and Education” (MDEV&EDU), “Organisational Studies” (ORG STUD), “Public Sector and Health Care” (PUB SEC), “Social Sciences” (SOC SCI) and “Strategy” (STRAT). For these fields, in order to get more relevant results from the research, we considered journals with AJG ratings of 4* (grade 4 journals that are recognised worldwide as exemplars of excellence), 4 (all journals with rating 4 publish the most original and best-executed research) and 3 (3-rated journals publish original and well-executed research papers and are highly regarded). The data were collected within Scopus (<https://www.scopus.com/>) since all the journals we decided to incorporate into the search were available in the academic database. Specifically, we performed a query in which we included all the chosen journals by entering their ISSN code and the keyword “Artificial Intelligence”. We did not use time or other restrictions. The query returned 1175 articles published between 1983 and 2022; citation and abstract data were exported in CSV format. We then described our dataset using the R tool Bibliometrix (<https://www.bibliometrix.org/>) to extract some preliminary information.

Our first task was the choice of the computational technique to be used. We initially performed an impact analysis using the R programming language through the CLR library available on GitHub (<https://github.com/rvidgen/clr>) to get quantitative data on the information contained in our dataset. Through this analysis, it is possible to estimate the impact of a given paper, author and journal. To measure these dimensions, the tool uses various metrics such as citation count, impact factor (total citation count divided by the total number of papers) and the h-index which is commonly used to assess the impact of researchers (Hirsch 2005). The h-index refers to the following ratio: a researcher with an index of 10 has published 10 papers each of which has been cited at least 10 times. The index is not devoid of problems, e.g. potentially relevant new articles are underestimated due to fewer citations, or authors who have received many citations for an article are penalised compared to authors who have fewer citations in many articles. However, it is generally accepted to measure the impact of an author or journal.

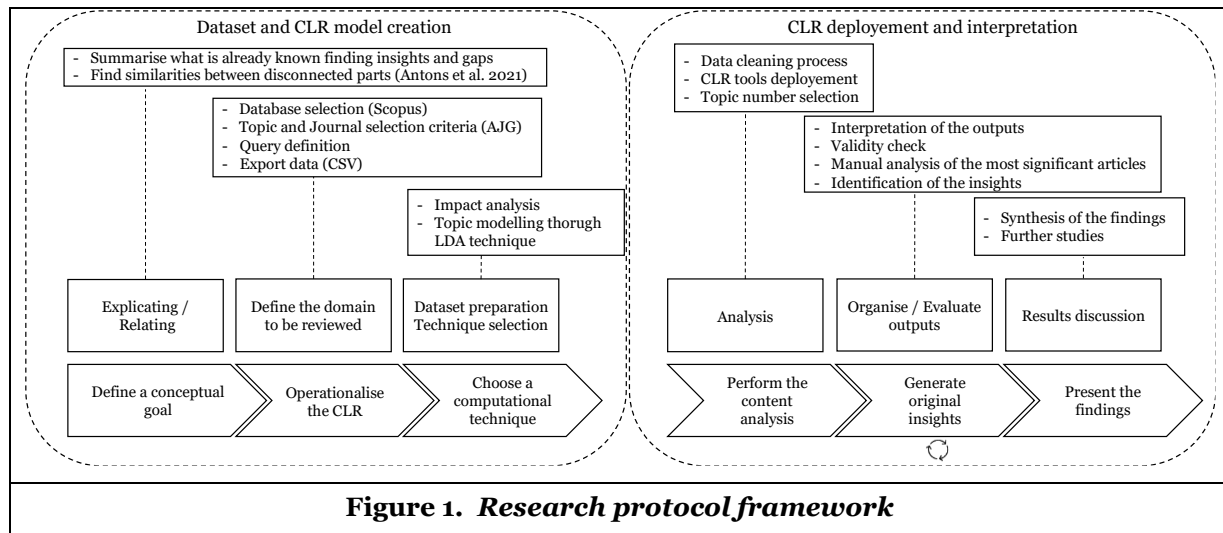


Figure 1. Research protocol framework

We then focused on the content analysis of the papers by performing topic modelling using the Latent Dirichlet Allocation analysis with the Text-Analytics_LDA tool (https://github.com/tqx94/Text-Analytics_LDA). We adopted LDA because it is the most popular method used for topic modelling (Jelodar

et al. 2019) and also this method seems to have a higher level of reliability and accuracy compared to the others (S. Rahman et al., 2020). LDA is an unsupervised generative probabilistic model of a corpus (Blei et al. 2003) that allows the identification of a set of topics among multiple documents. Each document is considered as a set of words that can be combined to form subsets of latent topics. The model assumes that the corpus includes k topics, then distributes these topics across each document to see which one fits best. In this way, the analysis is more efficient because it avoids cross-checking every word with every document. In order to perform the analysis, we had to clean our dataset. First, we deleted all the variables except for those related to abstracts and document id, then we removed punctuation, stop-words and tokenized the corpus to build the Document Term Matrix (DTM), which is a matrix that contains words and documents as dimensions. We also removed the search term “Artificial Intelligence”, along with other recurring words that might yield incorrect results such as “Elsevier”, “Springer”, “Research” and “Findings” (Mortenson and Vidgen 2016). When creating the DTM, we decided to tokenize the text using one or two words to avoid ambiguity during topic analysis. In fact, some words have a different meaning when taken individually (i.e. Information and System instead of Information System). Since LDA is an unsupervised technique, the number of topics to be used was chosen a priori. To better evaluate this choice, the tool calculated a coherence score to find the best number of topics. Topic coherence measures the degree of semantic similarity between high-scoring words in the topic. We then represented the words of each topic in a word cloud and, according to the coherence score that the algorithm gave to every document, we used topic modelling results to analyse the most representative contributions for each topic. Our goal was to discover how AI is implemented and deployed within different topics and also to detect the most popular fields of research in recent years. “Figure 1” describes the research protocol we adopted to explore the literature using the CLR method. The part dealing with output interpretation and article in-depth analysis within the framework should follow an iterative cycle to have more precise and significant results. In fact, it is necessary to repeat the analysis several times to reach output that is as relevant and reliable as possible.

Results

Impact Analysis

This study is useful to better identify the impact, in terms of citations, of the articles, authors and journals analysed. After the data cleaning process, the analysis was carried out on 1148 articles, only 105 of them (88 out of 105 were published between 2021 and 2022) have zero citation. This can be interpreted as a sign of quality with regard to the examined papers. In the appendix we show the 20 most cited articles. They were mainly published in the late 1990s and early 2000s. The exceptions are represented by some recent contributions, published in the middle of the last decade, dealing with topics that are still relevant today, such as the use of simulations within the supply chain, the use of big data analytics for decision support systems and predictive policing.

We have also represented the top 20 journals in terms of number of citations and impact (the ratio of a journal’s total citations to its number of publications within the analysed data). Not surprisingly, most of the journals with the highest number of citations are specialised in Information Systems (IS). The majority of them belong to the information management field of the AJG ranking. Interestingly, the journal with the highest number of citations (almost four times as many as the second) is Decision Support System (see Table 2). This highlights the importance of AI when it comes to decision making support, especially in light of the technological development in recent years. In fact, we have entered the cognitive generation of decision support, which implements, within the platforms, all the new technologies that are positioned within the digital transformation, such as AI (H. J. Watson 2017). As regards the journals with the highest impact, we noticed a greater heterogeneity of research domains. They range from the AJG field of social sciences to strategy. However, the information management component remains of paramount importance.

Rank	Journal	Cited	AJG Area
1	Decision Support Systems	14476	Information Management
2	J. of the American Soc. for Inf. Sc. & Tech.	4434	Information Management
3	Information Systems Research	3468	Information Management
4	Information and Management	1600	Information Management
5	Journal of Management Inf. Systems	854	Information Management
6	Journal of Business Research	716	General Man., Ethics, Soc. Resp.

7	California Management Review	680	General Man., Ethics, Soc. Resp.
8	Government Information Quarterly	577	Information Management
9	Journal of Environmental Management	570	Social Science
10	Information Systems Frontiers	508	Information Management
11	Environmental Science and Technology	500	Social Science
12	Risk Analysis	488	Social Science
13	Industrial and Corporate Change	460	Social Science
14	Research Policy	456	Innovation
15	Strategic Management Journal	454	Strategy
16	Journal of the Ass. for Information Systems	421	Information Management
17	Technovation	383	Innovation
18	Long Range Planning	301	Strategy
19	Information and Organization	198	Information Management
20	Journal of Strategic Information Systems	166	Information Management

Table 2. Top 20 Journals ranked by citation count and AJG Area

Content Analysis

The analysis was performed by constructing a topic model of the articles’ abstracts. After the data cleaning process, we determined the number of topics (K) for our model. In order to select the proper number of topics, we relied on the computation of the coherence score and on a manual analysis. “Figure 2” graphically represents the coherence score of our topic modelling analysis. Based on the score, we selected 15 topics that were manually revised to assess whether they were consistent with the words contained in them and whether two, or more, similar topics could be merged. We then named the topics and carried out some descriptive statistics to better describe them.

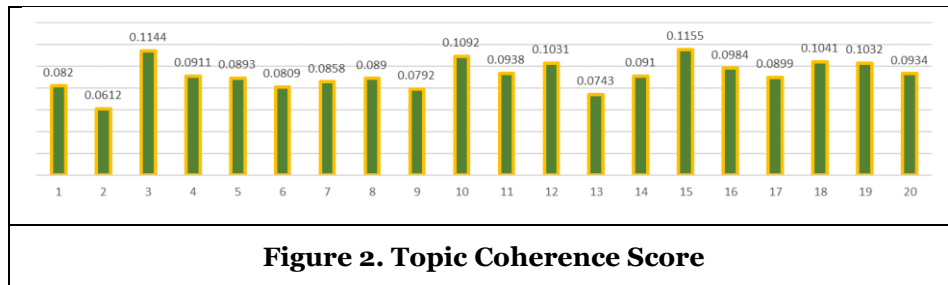
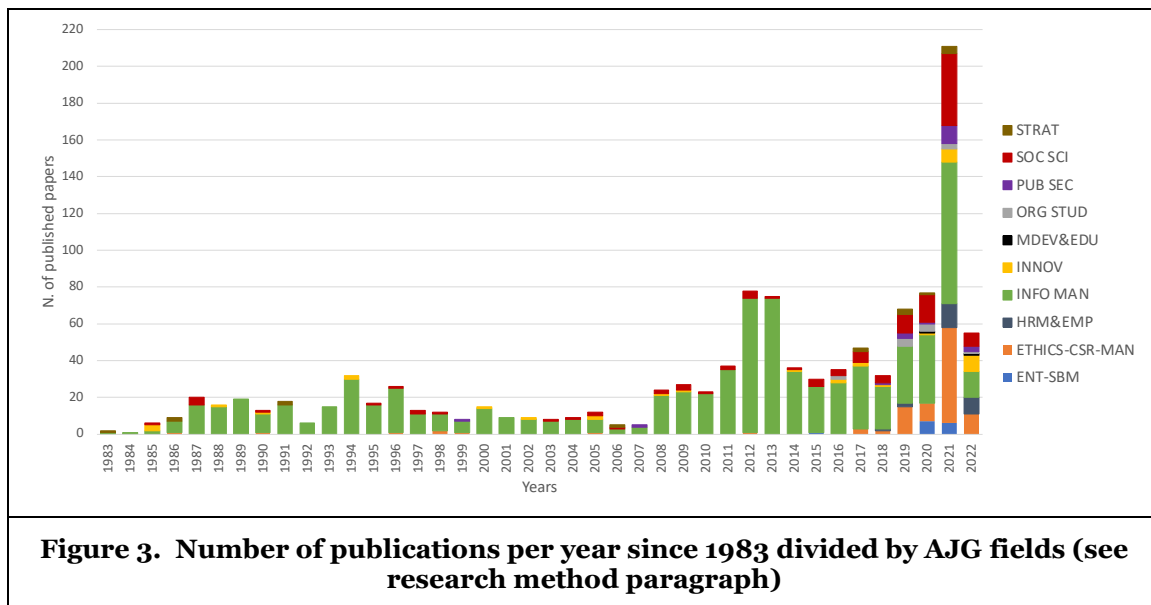


Figure 2. Topic Coherence Score

In the appendix we provide the word cloud representing the 15 most frequent terms for each topic together with a summary of the most significant articles included therein. The 15 topics are related to the different research areas in AI reviews, and they can be summarised as follows: 1) Societal Impact of Artificial Intelligence, 2) Data Intelligence and Accessibility, 3) AI Implications in Public Services, 4) DSS/Human Relationship, 5) Expert Systems Design and Development, 6) Project Evaluation, 7) IS Development Models, 8) Machine Learning Techniques, 9) Environmental Studies, 10) Business Innovation towards AI, 11) Product/Service Improvement, 12) Research Evaluation, 13) Decision Support System Development, 14) AI Influence and Acceptance, 15) AI Implications in Management.

The clusters related to the topics found are uniformly populated by a similar number of papers ($m = 76.53$, $sd = 17.15$). The only outlier is represented by topic 5 (Expert Systems Design and Development), which has 123 articles. For each topic, we represented the number of publications between 1983 and 2022 to determine the most recent trends in academic research. At the same time, we inspected the most important journals inside each topic to see which AJG research field is predominant. Not surprisingly, the topics that have had the highest number of publications in recent years such as Societal Impact of Artificial Intelligence, Environmental Studies, Business Innovation towards AI, AI Influence and Acceptance and AI Implications in Management, reflect many subjects considered of paramount importance by various companies in light of the digital revolution. Another area that has seen an article increase in recent years is the AI Implications in Public Services (topic 3), and this research field had another peak in the late 1980s coinciding with performance management reform in the public sector (West and Blackman 2015). Finally,

the topic Machine Learning Techniques has several peaks throughout the inspected period, but in the last period more articles have been published on the subject. As for the journals contained in each topic cluster ($m = 18.6$, $sd = 9.96$), it is not surprising that for almost every topic the most important AJG research field was Information Management. Topic 10 - Business Innovation towards AI and Topic 9 – Environmental Studies were the only exceptions, the former with nearly 50% of the journals related to Human Resource Management and Employment Studies and General Management, Ethics, Gender and Social Responsibility, and the latter with 86% of the journals related to Social Sciences. Business Innovation towards AI, AI Implications in Public Services and AI Implications in Management were also the topics with the highest number of journals, i.e. 32, 35 and 39, respectively. Many topics focusing on a specific argument were represented by the relevant AJG field with a significant percentage. For example, in topic 3 – AI Implications in Public Services, 22% of the articles refer to the AJG Public Sector field, in topic 6 – Project Evaluation, topic 11 – Product/Service Improvement, topic 14 – AI Influence and Acceptance and topic 15 – AI Implications in Management, a high percentage of the AJG research domains is represented by General Management, Ethics, Gender and Social Responsibility. Overall, the most represented topics in the AJG field are Information Management with 808 articles, Social Sciences with 118 articles and General Management, Ethics, Gender and Social Responsibility with 96 papers (see “Figure 4”). It is also very interesting to note that until 2018 almost all articles published on AI belonged to the AJG Information Management research area. Since 2019, however, research has also increased considerably in other areas and especially in journals belonging to the areas General Management, Ethics, Gender and Social Responsibility and Social Sciences (see “Figure 3”).



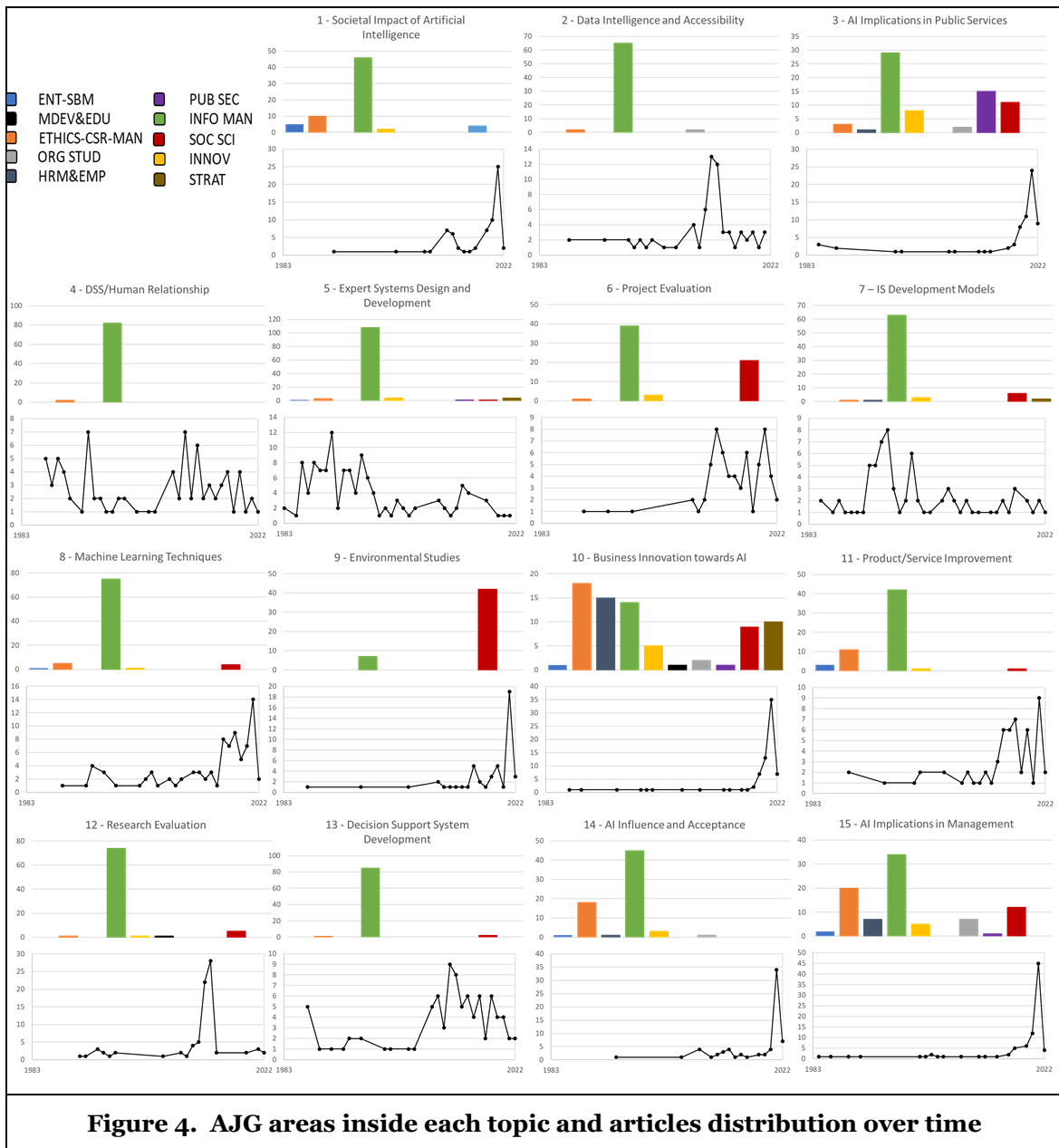
Discussion

After performing impact and content analysis, we decided to go one step further by specifically studying the content of each topic. We believe that a more in-depth manual study of the literature in each cluster helps to better understand the results of the topic modelling analysis and provides better insights. In our research, we created a table in which, according to the score assigned by the algorithm to each document, we entered the most significant papers for each topic, we then downloaded the entire text corpus of the articles and proceeded to a deeper analysis to better identify the topics covered for each cluster. This further study allowed us to refine the titles and extend our knowledge of each topic. We therefore give a brief description of each topic in the following lines, citing the most significant sources for each of them.

Topic 1 – Societal Impact of Artificial Intelligence: It primarily discusses the relationship between our social structure and new AI-based technologies, as well as the possible consequences of their massive adoption in our society. The consequences are not always positive; several ethical, social and financial problems may arise. The risks include the development of digital beings that do not respond to the moral laws of civil society (Mulgan 2019), the problems of acceptance of new technologies by users accustomed to using old

ones, and the role that governmental structures will play in this transition (Lundvall 2017). The topic also discusses the use of AI to improve the reliability and user experience of various communication tools such as forums and blogs (Mousavi et al. 2020; Zach 2012).

Topic 2 – Data Intelligence and Accessibility: Attention is paid to the use of search and clustering tools to improve user experience. In particular, we mention two case studies on the development of multilingual search tools able to facilitate access to business intelligence information by non-English speakers (Chung et al. 2004; Jialun Qin, Yilu Zhou 2006), and a case concerning the development of new phrase clustering methods for document classification (Xiaoyan Cai 2011). E. Foss (2013), on the other hand, focuses on the Internet search habits of a group of young Americans to make recommendations to designer, educators and researchers to better educate young people in research.



Topic 3 – AI Implications in Public Services: The focus is on the increasing introduction of AI tools in public administration and its results. Vogl et al. (2020) state that the adoption of AI tools within United Kingdom local authorities on the one hand automates some processes, but on the other hand creates a new form of

relationship with administrators called algorithmic bureaucracy in which they learn from each other. Wilson (2022) conducted an analysis of AI implementation strategies in 16 countries, and his results denote a lack of attention towards public engagement which is important to counterbalance the ethical and social risks related to AI. Af Malmborg et al. (2021) study the adoption processes of European Union (EU) AI policies by the Nordic countries, and their findings describe a high level of reception by the countries under examination, however countries with more organisational capacity are found to adopt EU policies on AI in a more effective manner. Finally, Gao et al. (2021) inspect the Open Government Data (OGD) phenomenon by identifying four stages of development. In this research, the author identifies a further phase in which AI analytics and Internet of Things (IoT) will enable more value to be created from open data, therefore it will be important to study the design of infrastructures for data collection and analysis.

Topic 4 – DSS/Human Relationship: The distribution of papers within this topic has several peaks over the 40 years examined, indicating that the topic has always been of interest to researchers. The articles focus on the role of DSS in facilitating people's tasks. The most recent papers investigate the confirmation bias reducing the effect of DSS along with increased satisfaction in decision making and the effect of interactive analytic dashboards on users' cognitive abilities and tasks (Huang et al. 2012; Nadj et al. 2020).

Topic 5 – Expert Systems Design and Development: The discussion focuses on the development and integration of expert systems, where AI is the basis of these systems that simulate human intelligence to perform support tasks and strategic planning activities (Beeri and Spiegler 1996; Goul 1987).

Topic 6 – Project Evaluation: The most significant articles in this topic focus on the use of AI as an improvement in risk management and project evaluation methods. Specifically, unsupervised statistical techniques such as principal component analysis are applied to improve project control methodologies (Colin et al. 2015), while Hu et al. (2013) propose a framework for intelligent risk planning software in order to reduce project risks by predicting project outcomes.

Topic 7 – IS Development models: Different types of information systems and their underlying models are analysed. Pendharkar (2007) examines the performance of distributed AI systems for production scheduling, while Laitila et al. (Laitila and Virtanen 2022) provide two new approaches to the use of the ranked nodes method used in DSS systems.

Topic 8 – Machine Learning Techniques: this topic focuses on the development and use of Machine Learning Techniques. ML is used for multiple purposes, some examples of which include the use of algorithms to develop DSS systems based on imbalanced datasets (Piri et al. 2018), the development of techniques for bankruptcy prediction (Lee et al. 1996; Smiti and Soui 2020) and the study of various approaches to improve the accuracy of predicting the success of movies (Lee et al. 2018).

Topic 9 – Environmental Studies: This topic discusses the use of techniques based on AI algorithms for environmental studies. Particular reference is made to the measurement of contamination of various chemical agents in water and air (Dashti et al. 2018; Elzain et al. 2021).

Topic 10 – Business Innovation towards AI: This topic looks at the impact of AI and related technologies on companies. Various areas are examined although, among the most significant articles, greater attention is given to the implementation method of new technologies and the effects they have on workers. Sjödin et al. (2021) conducted an empirical study on six manufacturing companies engaged in Digital Servitization and was able to identify the key AI capabilities for the development of a business model. Felten et al. (2021) theorise and validate a new measure to study the effects of AI on employment and organisations. These measures can be used to identify the sectors that are most affected by AI or the effect it has on markets and organisations. Holm and Lorenz (2021) studied the effect of AI on workers in Denmark and found a difference in impact depending on job position and AI function.

Topic 11 – Product/Service Improvement: This topic refers to factors that threaten or contribute to the improvement of a given product or service within a market. Grewal et al. (2021) give a framework to understand the advantages and disadvantages of AI within the B2B and B2C sectors. Wang et al. (2018) focus on the mobile app market to study the impact copycats have on original apps, suggesting a machine learning method to detect them. Lappas et al. (2016) study the effect that fake reviews have on online visibility within the hospitality industry.

Topic 12 – Research Evaluation: Papers in this topic address particular research techniques, especially those regarding measurement method refinement. Within this topic we were unable to find any explicit reference

to AI. After a deeper analysis of the papers in this topic, we noticed that the articles were included in the dataset because the keyword "Artificial Intelligence" was listed among the indexed keywords that Scopus had assigned to each paper (indexed keywords are chosen by Scopus and are standardised to vocabularies derived from thesauri).

Topic 13 – Decision Support System Development: These articles focus on the development of decision support systems to improve the effectiveness and efficiency of various tasks. Suzuki (Suzuki 2009, 2012) develops a system that saves the cost of petrol for couriers by altering the route of trucks so that they can fill up at cheaper petrol stations, while Bandeira et al. (2009) develop a system for the efficient distribution of containers within facilities.

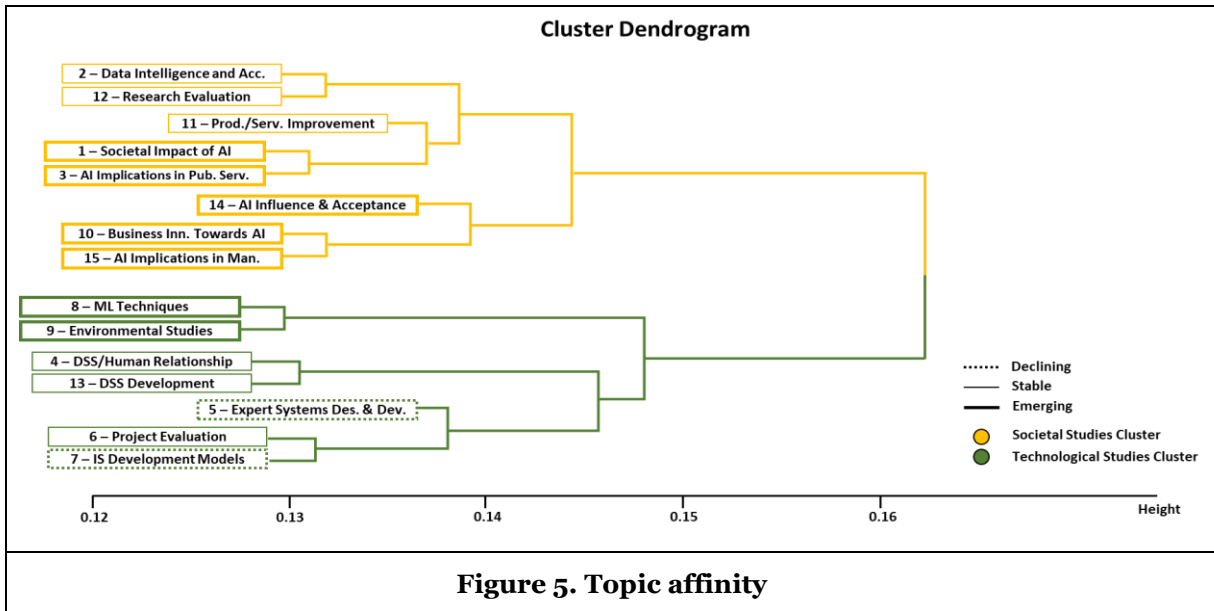
Topic 14 – AI Influence and Acceptance: The main discussion in this topic refers to the interaction between humans and AI-based technologies and consequently to the user's reaction. Cheng et al. (2021) study consumer response and trust to chatbots within e-commerce websites and identify attitudes towards them in different situations. McLean et al. (2021) focus on the attributes of AI voice assistants that most influence consumer brand engagement such as social presence and perceived intelligence. Upadhyay et al. (2021), on the other hand, add to the research on digital entrepreneurship by identifying factors that contribute to the entrepreneur's intention to embrace AI.

Topic 15 – AI Implications in Management: This topic discusses the impact that new technologies based on AI have within companies and the practices that management should adopt to improve the outcomes of digitisation. Larson and DeChurch (2020) identify 12 leader implications from digital technologies that affect teamwork organisation. Johnson et al. (2021) discuss the possibility of task automation in management processes and its implications. Teodorescu et al. (2021) explore the debate regarding Human – ML augmentation, especially the concept of ML fairness to reduce automated decision bias. They argue that the IS research on the argument must be partially redesigned and expanded, thus opening new possibilities for IS researchers. Finally, Pereira et al. (2021) review the literature on the impact of AI in the workplace, contributing to the study of the effects of new technologies on human resource function.

Another objective of the content analysis was to assess the accuracy of topic modelling by detecting closely related topics. We constructed a dendrogram using Hellinger's Distance to determine the topic that could be merged based on the similarity of the probabilistic distributions. In light of the results derived from the in-depth examination of each topic, a very interesting result emerged, allowing us to identify two macro topics within our research. Looking at "Figure 5", when cutting the dendrogram at the highest point, we note the presence of two clusters. The first one is composed of the following topics: 1) Societal Impact of Artificial Intelligence, 2) Data Intelligence and Accessibility, 3) AI Implications in Public Services, 10) Business Innovation towards AI, 11) Product/Service Improvement, 12) Research Evaluation, 14) AI Influence and Acceptance, 15) AI Implications in Management. The second one encompasses: 4) DSS/Human Relationship, 5) Expert Systems Design and Development, 6) Project Evaluation, 7) IS Development Models, 8) Machine Learning Techniques, 9) Environmental Studies, 13) Decision Support System Development. Looking at the contents of each topic, one can easily see that the first cluster mainly refers to societal studies. In fact, the various topics cover recurring themes such as the study of the impact that AI has on companies, public administration and society. Secondly, they investigate how AI-based technologies can be used to improve work at different levels of employment and to advance both new and widely used products and services. Finally, it is crucial to note that a major recurring topic, especially in topic 14, is the personification of AI and the study of the human-AI relationship. The articles in the topics of the second cluster are mainly technical in nature. They focus on the study of algorithms and statistical techniques to improve AI artefacts. The only exception is Topic 4) DSS/Human Relationship, which is located in the second cluster due to its close similarity with Topic 13) Decision Support System Development. This allocation is due to the semantic similarity of the two topics. In particular, the recurring presence of common words biases the algorithm into placing the topic within the second cluster even though the main focus is on social studies. The two topics are in fact complementary and respectively investigate the effect that DSS have on their users and the development of new applications for the enhancement of operations.

Interestingly, most of the papers within the topics in the first cluster were published in recent years. This is in line with what is seen in "Figure 3". Since 2019, research on AI is increasingly specialising in the social field, inspecting the impact and relationship between AI technology and humans. This phenomenon may be explained by several factors, such as the change in humans' perception of AI-related technologies. They

are moving from being seen as mere objects to being perceived as digital beings (Dignum 2018). This paves the way to new research frontiers where AI is compared to human beings. Another factor may be the acceleration of Digital Transformation in response to the Covid-19 pandemic that increased the positive perceptions about digital work (Nagel 2020). This could be an explanation of why the publication in Public Sector and Human Resource Management areas increased in 2021 (“Figure 3”).



In “Figure 5” we highlighted the presence of the two macro clusters and, referring to the trend of publications over the years (“Figure 4”), we specified for each topic whether it was *declining*, *stable* over time or *emerging*. We then focused on topics whose debate is emerging due to the increase in publications over the last 3 years. For each of them, based on an in-depth analysis, we tried to identify possible research opportunities (Table 3). In support of our theory, we can also note that the societal study cluster does not include topics that have a declining publication trend. This is consistent with our findings; the societal research branch of AI is currently emerging within the organisational debate.

Topic	Description	Future Research Questions
1 – Societal Impact of Artificial Intelligence	Impact that AI has in our society and possible future societal and individual consequences	<ul style="list-style-type: none"> • What are the effects of new technologies on the world economic system and social inequality? • What role does AI play in the development (or restriction) of human knowledge and cognitive capabilities? • What are the ethical implications of using AI to moderate blogs and social networks? What are the effects on human behaviour and human cognition?
3 – AI Implications in Public Services	Results on AI adoption in the public sector	<ul style="list-style-type: none"> • What are the organisational and regulatory implications of adopting AI-based technologies in the public sector? • Do national government strategies influence and foster AI adoption by companies?
8 – Machine Learning Techniques	Development and testing of ML techniques and applications	<ul style="list-style-type: none"> • Is it possible to define guidelines for adopting/developing ML algorithms in new and still unexplored organisational contexts? • Since AI tools are becoming pervasive in organisations and society, how can we shape the concept of “AI ecosystem”? What are its main characteristics? Which aspects should we investigate and with which perspective?
9 – Environmental Studies	Development of AI applications for	<ul style="list-style-type: none"> • How can AI be applied to measure and prevent environmental phenomena?

	environmental issues	<ul style="list-style-type: none"> • How can AI be used to improve simulation models of environmental phenomena, and what could its social and political impacts be?
10 – Business Innovation Towards AI	AI impact inside companies and results of AI tools adoption	<ul style="list-style-type: none"> • Since AI represents a breakthrough technology for organisations, how does AI affect IT values? How should we rethink theories and concepts related to IT values? • How and to what extent do AI capabilities change depending on the industry in which companies operate? Does it always represent a disruptive technology, or could it sometimes be just a supportive or sustaining technology?
14 – AI Influence and Acceptance	Debate on AI/Human interaction process	<ul style="list-style-type: none"> • What are the effects of the increasing use of AI applications on individuals from an organisational, societal, and psychological perspective? • How is the Human/AI difference perceived in different work environments? What are the main variables affecting the perception of Human/AI differences? • What could be the variables that influence (either positively or negatively) the adoption of AI applications by individuals?
15 – AI Implications in Management	Implications that AI implementation brings to management	<ul style="list-style-type: none"> • What are the psychological and operational implications of hybrid human/AI teamwork? • What aspects can make the adoption of AI more transparent, fair and democratic? • What are the effects of AI human augmentation in organisational settings?
Table 3. Topic description and possible guiding question for future research		

Conclusion

In this paper we performed a CLR to explore the AI debate inside organisational and managerial studies. In parallel, thanks to the impact and content analysis, we also recognised in which journals and research areas the debate has developed over the years.

Adopting an algorithm for topic modelling, we identified 15 topics concerning the debate on AI in the corpus. We then confirmed our findings with an in-depth analysis of the most significant literature within each topic. The results show a trend in recent years where research is much focused on the impact of AI on organisations and its societal and individual implications on different stakeholders. Based on topic similarity, it is also possible to distribute the 15 topics into two macro groups respectively representing the sociological and technical strands of research, focusing mainly on the emerging topics, suggesting possible future research.

The contributions of the research are manifold. From a theoretical point of view, we implemented the framework given by (Antons et al. 2021) adding an important step that in our opinion contribute to the clarity of the research and to the accuracy of the results, namely the in-depth analysis of the most significant articles in each topic, which makes the interpretation of results an iterative step aimed at constantly improving the results. CLR allows us to qualitatively analyse a large amount of data. As mentioned, the benefits are numerous. First of all, a very large number of articles can be examined, in terms of both content and impact. CLR also allows scholars to conduct research in a time-saving manner, as it is quite difficult to analyse thousands of documents manually in a limited amount of time. This method also enables a more efficient approach to the investigation of a research domain. In fact, most of the authors who have dictated some guidelines on this subject recommend it especially to PhD students at the beginning of their academic path. The CLR method also allows multi-domain literature to be analysed in a rigorous and replicable manner. Finally, we hope that this article will help other researchers who intend to conduct a similar analysis by adopting the CLR method. Consequently, we believe it is important to describe each step in detail to make the research as replicable as possible.

From a managerial perspective, this research contributes to the identification of two distinct research strands and their publication trend. The study can offer insights to managers facing decisions on the adoption of AI-based technologies by guiding them through the most impactful research studies published in leading international journals, so that they can be aware of its potentialities as well as some related criticalities. In addition, many societal studies (first macro-cluster), along with possible research opportunities, focus on the ethical and psychological implications of AI adoption in organisations. These aspects are part of the Responsible AI phenomenon, which aims, among other things, at making the principles of AI adoption more transparent, fair and democratic. It is therefore of paramount importance that managers focus on the needs of internal and external stakeholders in their AI adoption agenda². Our hope is that this article will provide insight into the growing importance of social studies within the AI debate and raise awareness among managers and policymakers.

Despite some similarities with bibliometric analysis, such as impact analysis and dataset description, CLR goes further and provides the ability to qualitatively analyse articles by giving information about their contents. However, this research has some limitations. First of all, the analysis is only based on abstracts and not on the entire content of each paper. Even though the purpose of the abstract is “*to facilitate quick and accurate identification of the topic of published papers*” (Peter Luhn 1958), we argue that a more in-depth analysis of the contents of the text corpus can improve the final results by providing further insights. Another limitation concerns the breadth of the research, as we only examined a small portion of the publications on this topic. A further step could be to extend the search beyond the AJG ranking and the Scopus database and cross-reference other research databases such as Web of Science or Business Source Ultimate. Future studies might also focus on the use of different analysis techniques and tools that could lead to further insights and reduce algorithm biases. Nowadays, the proliferation of scientific literature increases the need for systematic, replicable and rigorous literature review, as well as the resources needed to conduct them (Badger et al. 2000). This study was the starting point of a research project, providing a first attempt to combine the rigorosity of literature reviews and the advantages of computational techniques. Finally, we used the CLR method as we needed to analyse a large number of articles in a semi-automatic way, trying to obtain, as a preliminary result, a qualitative evaluation of their content.

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² David Kiron, Elizabeth Renieris, and Steven Mills (2022), Why Top Management Should Focus on Responsible AI, MIT Sloan Management Review. Available at: <https://sloanreview.mit.edu/article/why-top-management-should-focus-on-responsible-ai/>

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