Writing faster.

How to support systematic literature review process with AI tools?

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Abstract

Science automation, driven by advanced technologies like artificial intelligence (AI), is reshaping research across diverse domains, such engineering, medical sciences and management, including marketing. The exponential growth of systematic literature review (SLR) papers underscores the need for automation to manage the rising workload efficiently. This article presents the possibilities of using artificial intelligence to automate the systematic literature review process in management. It answers the question: how AI can support a systematic literature review process? Our research design outlines an approach, highlighting the importance of staying updated with evolving AI technologies. Assessing 21 AI applications we propose a ranking of the most useful ones, based on functionalities they offer in the SLR process. In conclusion, this study offers crucial insights into the dynamic interplay of science automation, AI, and systematic literature reviews. We further recommend to work on developing the SLR process by introducing the concept of a "separated AI systematic literature review pathway" to optimize research tasks.

Keywords: *Artificial Intelligence, Science Automation, Systematic Literature Review*

1. Introduction

The concept of science automation represents a pivotal paradigm shift in scientific research, incorporating advanced technologies such as robotics, artificial intelligence (AI), and machine learning to streamline and optimize various scientific processes. This paradigm spans multiple domains, including computer science, mathematics, health services research, data science, engineering, materials science and management and management including marketing. In particular, the fusion of AI and automation has given rise to novel tools and methodologies that can significantly enhance the efficiency, accuracy, and accessibility of scientific research (Fleischer et al., 2018). The rationale for the need to automate systematic literature reviews (SLR) in the management, accounting and finance sciences is their exponentially increasing number (Fig 1.) and their extraordinary, compared to empirical articles, workload intensity.

Due to the small scope of studies in this field in the field of management sciences, the literature review has been enriched with articles in the field of natural sciences.

2. What is science automation?

Science automation refers to the use of automated technologies and processes to perform scientific tasks and experiments. It involves the application of robotics, artificial intelligence, and other advanced technologies to streamline and enhance scientific research and analysis (Fleischer et al., 2018). Automation in science can also be applied to various fields, including computer science, mathematics, health services research, systematic reviews, data science, engineering, and materials science (Leydesdorff & Rafols, 2009; Shneiderman, 2001; Chishtie et al., 2020; Legate & Nimon, 2022; Liu et al., 2020; Fleischer et al., 2018; Chu et al., 2015; Mattes et al., 2019; Li et al., 2022).

It captures automated systems and algorithms to streamline and optimize various processes in the field of management, including the scientific process. This includes the integration of automation technologies such as robotics, artificial intelligence and machine learning (ML) into management workflows to improve efficiency, decision-making, and overall performance and data science. Automation techniques, such as automated machine learning (AutoML) systems, have been developed to assist data scientists and domain experts in these tasks. These systems leverage ML automation techniques to streamline and accelerate the data science lifecycle, improving productivity and enabling more efficient decision-making (Wang et al., 2021).

The specific areas where science automation is being applied are bibliometrics, sentiment analysis, systematic reviews and meta-analyses (Legate & Nimon, 2022). Nowadays, researchers in computer science and management sciences are using machine learning methods to develop systems and algorithms for analyzing sentiment in literature (Keramatfar & Amirkhani, 2018). This automated analysis of sentiment can provide valuable insights into the impact and importance of research in management. Another area to automate is systematic literature review.

3. What is systematic literature review?

Systematic literature review is a research method that enables the identification, selection, critical evaluation, and synthesis of existing literature in a rigorous, transparent, and repeatable manner, leading to robust conclusions about what is known and what is not known in peerreviewed research areas (Christofi et al. 2021). It is used in scientific journals in various

fields (Vrontis and Christofi 2019). Figure 1 illustrates the immense growth of this method, especially within the last few years.

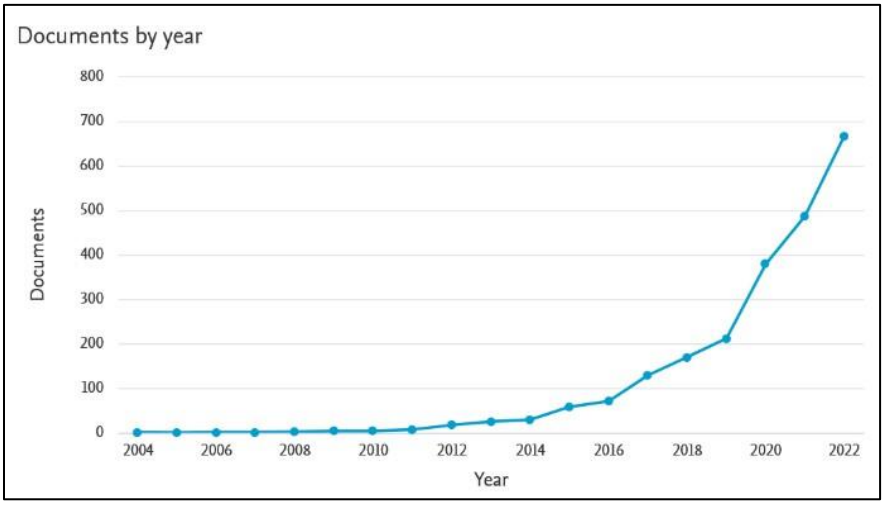

Fig. 1. Systematic literature reviews publications in management, accounting and finance trend

According to Scopus, in 2022, 667 scientific articles in the field of management, accounting, and finance were published, in which this method was the basic one. Compared to 487 in 2021 and 379 in 2021, an upward trend close to exponential can be seen.

4. Why to automate systematic literature review in management sciences?

Automating systematic literature reviews in management sciences offers several benefits. Firstly, it allows for a more efficient and timely review process. Conducting a systematic literature review manually can be time-consuming, taking anywhere from six months to several years for a full-time researcher (Altena et al., 2019). Automation tools can help speed up the process while maintaining the high standards associated with a systematic review (Altena et al., 2019).

Secondly, automation can improve the accuracy and reliability of the review process. Manual reviews are prone to human error, such as overlooking relevant studies or misinterpreting data. Automation tools can help minimize these errors by using machine learning techniques to identify and extract relevant information from a large volume of literature (Dinter et al., 2021). This can lead to more comprehensive and reliable reviews.

Thirdly, automation can enhance the reproducibility and transparency of systematic reviews. By using automated tools, researchers can document and track each step of the review process, making it easier for others to replicate the study and verify the findings (Tsafnat et al., 2014). This promotes transparency and allows for a more rigorous evaluation of the review methodology.

5. Artificial intelligence in academic research

Artificial intelligence, refers to the development of computer systems that can perform tasks that typically require human intelligence. These tasks include learning, reasoning, problemsolving, perception, and language understanding (Bansal et al., 2020). AI systems are designed to process and analyze large amounts of data, identify patterns, and make predictions or decisions based on that data (Janssen et al., 2020).

AI has become increasingly relevant in academic research, with its applications and implications being explored in various fields. AI is being used to speed up the research process and support researchers in various tasks. It is perceived as helpful in information gathering and other narrow tasks, as well as in supporting impact and interdisciplinarity (Chubb et al., 2021). However, there is a concern that the use of AI to "speed up" research processes may contribute to negative aspects of academic culture and should be seen as a tool to assist, rather than replace, human creativity (Chubb et al., 2021).

6. Research question

Based on the above considerations, the research question is as follows: how AI can support a systematic literature review process?

7. Research design

To answer the research question, an overview of artificial intelligence applications and how they can be used at different stages of a systematic literature review is presented based on the systematic literature review procedure, following the below points:

a) review question (Christofi et al. 2021; Leonidou et al. 2018; Mcquade et al. 2021; Vrontis and Christofi 2019),
b) data collection with keywords identyfication (Christofi et al. 2021; Mcquade et al. 2021),
c) final database preparation - inclusion or exclusion criteria, selection of relevant and high impact studies (Leonidou et al. 2018; Vrontis and Christofi 2019),
d) bibliometric analysis/descriptive statistics (Mcquade et al. 2021; Siemieniako et al. 2022; Vrontis and Christofi 2019),
e) data extraction/synthesis/ thematic/content analysis (Leonidou et al. 2018; Mcquade et al. 2021; Siemieniako et al. 2022; Vrontis and Christofi 2019) or synthesis (Christofi et al. 2021; Leonidou et al. 2018; Vrontis and Christofi 2019),
f) report preparation with contributions, limitations and recommendations presentation (Christofi et al. 2021; Vrontis and Christofi 2019).

First, we identified AI applications aviable in the market. Those that appeared in theresanaiforthat.com after a search for the keywords 'scientific research' and ‘academic research’ were considered as such. We identified 15 such applications. We have supplemented this set with 6 non-listed applications useful in the process of systematic literature review we knew about earlier. So finally, we identified 21 aplications.

We qualitatively assessed the applications (0-1) by matching the functionalities found in the application with the stages of the systematic literature review. If functionality was present, we rated the application at one, if not, at zero. Those applications that supported at least one feature of the systematic literature review were eligible for the study (all applied). We created the list of applications on September 28, 2023.

8. Results

As a result of the research, we obtained a matrix of applications and their assigned functions. The rows contain the names of the applications and the columns the stages of the systematic literature review, which are the evaluation criteria (from question to report). The next columns concern the ability to upload author's own PDF documents. "1 PDF" means that the application can analyse one document at a time and "more PDF's" means that it can analyse more of them at the same time. The "SUM" column shows the point totals for each application.Table 1 presents the results of the study.

Tool	Question	Data	Database	Extraction	Report	own PDFs	1 PDF	More PDFs	SUM
Epsilon	1	1	1	1	1	1		1	7
Textero	1	1	1	1	1	1	1		7
MirrorThink	1	1	1	1	1				5
SciSpace		1	1	1		1	1		5
Open Read		1	1	1		1	1		5
Scite	1	1	1	1	1				5
Elicit		1	1	1		1		1	5
Consensus.app	1	1	1	1	1				5
Research Buddy		1	1	1	1				4
AcademicGPT				1	1	1	1		4
Perplexity		1	1	1	1				4
PowerDrill				1	1	1		1	4
Jenni		1	1	1	1				4
Semantic Scholar		1	1	1					3
SystemPro		1	1	1					3
SciSummary				1		1	1		3
Scholarcy				1		1	1		3
ResearchAIde				1		1	1		3
Cambiran		1	1	1					3
Paper Digest		1	1	1					3
Julius				1	1				2
SUM	5	15	15	21	11	10	7	3	**87**

Tab. 1. The results of AI applications analysis

The applications analysis can be summarized based on their ranking in the "SUM" column as follows: Epsilon and Textero are the top-ranked apps, offering comprehensive research features encompassing data analysis, database access, extraction, reporting, and PDF management. MirrorThink, SciSpace, Open Read, Scite, Elicit, and Consensus.app follow closely, excelling in various research aspects, including database access and extraction. Research Buddy, AcademicGPT, Perplexity, PowerDrill, and Jenni have moderate rankings, focusing on specific research needs such as database access and content generation. Semantic Scholar, SystemPro, SciSummary, Scholarcy, and ResearchAIde are lower-ranked, emphasizing and report generation. Cambiran and Paper Digest are similar in providing data and database access. Julius has the lowest rank, specializing in with limited coverage in other research areas.

The applications described are very diverse in terms of the characteristics presented, as evidenced by coefficient of variation read from the last row: Vc = 65%. This means that the market for applications to support researchers performing a literature review is diversed.

It is worth noting that there is not a single application in the list that performs bibliometric analysis. Such functions are primarily contained in the science mapping software (Chen 2017, Moral-Muñoz et. al., 2020).

The applications in question differ in the quality of the tasks performed. A detailed analysis of this issue requires a separate study.

9. Conclusion

In conclusion, researchers conducting systematic literature reviews in management sciences have a wide array of AI tools at their disposal. The choice of an application should be based on the specific requirements of the research project, as these tools offer varying degrees of support across different stages of the systematic literature review process. Additionally, for bibliometric analysis, researchers may need to explore specialized software beyond the applications listed in this study.

10. Limitations

The main limitation of the study is the subjective classification of the features of the software presented. In the case of more detailed stages of a systematic literature review, analysis by competent judges would be necessary. Additional limitation is the zero-one assessment of functionality. It is obvious that applications that perform e.g. data extraction do so at different levels of sophistication. Moreover, the analysis does not include applications for ancillary activities such as copywriting or grammar checking. An important limitation for the study is also the ambiguity of legal regulations and ethical issues regarding the use of artificial intelligence in scientific writing.

11. Further research directions

We recommend the researchers conducting systematic literature reviews in management sciences to perform qualitative assessments of tested AI applications to thoroughly differentiate their functionalities. Exploring innovative AI-powered approaches that separate and automate various SLR stages can significantly enhance research efficiency. Leveraging AI tools such as Textero or Epsilon for idea generation and source searching could streamline the research process. Furthermore, researchers should consider collaborating with AI to enhance narrative writing and optimize article structure. Staying informed about evolving AI technologies and being open to adapting research methodologies will keep researchers at the forefront of scientific innovation, ultimately improving research quality and productivity. It is worth noting that the use of artificial intelligence can lead to a dominant role for software over humans, previously resulting in a kind of „artificial subjectivity” of the review and a lack of control of the author over its results. In this situation, it seems necessary to develop a "separated AI systematic literature review pathway" strategy for working with artificial intelligence in this area. Undoubtedly, ethical and legal issues related to the use of artificial intelligence in scientific activities also require analysis.

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