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ENHANCING THE QUALITY OF ACADEMIC PAPER ABSTRACTS USING LARGE LANGUAGE MODELS: A CASE STUDY ON "DIGITAL ECONOMY" PAPERS IN CHINA NATIONAL KNOWLEDGE INFRASTRUCTURE (CNKI)

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Abstract: To evaluate the writing quality of academic paper abstracts and explore the applicability of large language models (LLMs) in abstract optimization, this study selects 5,054 papers on the topic of "Digital Economy" from CNKI as samples. A quantitative scoring analysis assesses the abstracts' performance in four dimensions: research objective, research methodology, research results, and research conclusions. Additionally, abstracts with significant deficiencies are regenerated using LLMs and subsequently evaluated. The data reveal that 57.44% of the abstracts fail to effectively summarize the core content of the research, with particularly pronounced issues in the descriptions of research methodology and results. Abstracts generated by LLMs exhibit excellent structural integrity, logical coherence, and linguistic conciseness. The findings indicate that academic paper abstracts in China have significant deficiencies in expressing research methodology, results, and conclusions, necessitating improvements through technological means. Given their strong capability in abstract writing, LLMs should be utilized to enhance the quality of academic abstracts.
Keywords: Academic paper abstract; Abstract quality; Large language model; Qwen; Scholarly communication

1 INTRODUCTION

The abstract of an academic paper is a core component, serving as the reader's first gateway to research information. A high-quality abstract efficiently conveys the essence of the study in a concise manner. According to the GB/T 6447 Guidelines for Abstract Writing, an abstract should include at least the research objective, methodology, results, and conclusions, presenting the main information of the paper equivalently. Ideally, a reader should be able to grasp the key points without reading the full paper [1].

However, the quality of abstracts in Chinese academic papers varies significantly. Some abstracts are vague, structurally incomplete, or even disconnected from the core content of the paper, which hinders academic communication and limits the dissemination of research findings [2]. This issue has become even more pronounced in today's increasingly competitive academic environment.

In recent years, "Digital Economy" has emerged as a trending research topic that has garnered widespread attention from academia. Many papers on this subject have been published in recent years, making it a relevant and up-to-date area for assessing the overall quality of academic abstracts. Analyzing abstracts in this domain can reveal common issues and provide empirical support for improving abstract writing.

At the same time, the rapid advancement of artificial intelligence (AI) presents a new approach to addressing this issue. Large language models (LLMs), such as ChatGPT and Tongyi Qianwen, have demonstrated exceptional capabilities in text generation and content summarization. These models offer new opportunities to enhance the clarity and completeness of academic abstracts [3]. Exploring the potential of LLMs in generating high-quality abstracts can not only improve abstract quality but also enhance the dissemination of research findings.

This study systematically evaluates the writing quality of academic abstracts from CNKI's "Digital Economy" papers by quantitatively assessing their performance across four dimensions: research objective, methodology, results, and conclusions. Based on an analysis of existing issues, this study further examines the applicability and effectiveness of LLMs in abstract generation. By comparing original abstracts with LLM-generated versions, we explore the advantages and limitations of LLMs in enhancing abstract quality, aiming to provide theoretical and practical guidance for standardizing and optimizing academic abstract writing.

2 LITERATURE REVIEW

2.1 Standards and Quality Issues in Academic Abstracts

As an essential component of academic papers, the quality of abstracts directly affects the dissemination and impact of research findings. However, numerous common issues persist in abstract writing, including insufficient information, lack of independence and self-explanatory content, redundancy, lack of objectivity, and imprecise language [4-7]. These problems not only reduce readability but may also negatively impact the visibility and citation rates of academic papers.

According to international and domestic academic standards, abstracts should concisely summarize a study's key findings and conclusions while maintaining objectivity and comprehensiveness. An abstract should be self-contained and use clear, concise language to convey the core content of the paper without requiring reference to the full text[5].

Precision in language is crucial, and excessive complexity should be avoided. Most scientific journals explicitly require abstracts to follow a structured format, including research objectives, methods, key results, and conclusions. Additionally, abstracts must remain neutral, avoiding personal commentary or extraneous explanations to ensure clarity and objectivity.

In practice, common problems in academic abstracts include structural incompleteness, vague content, and deviation from their intended function [6]. Some authors include introductory content—such as background and motivation—while failing to adequately summarize key research components. This results in overly broad abstracts that lack substantive information [8]. Additionally, some abstracts omit critical elements such as research objectives, methodology, key findings, and conclusions, making it difficult for readers to grasp the essence of the study [9]. Moreover, broad or ambiguous language is frequently used, preventing readers from accurately understanding the study's contributions [10].

Improving the quality of academic abstracts requires joint efforts from authors and editors. Authors should ensure that their abstracts are self-explanatory and independent while maintaining linguistic precision [11]. Editors, on the other hand, should enforce rigorous standards and guidelines during the peer-review process to enhance abstract quality at the editorial level. By standardizing abstract writing and implementing stringent editorial oversight, academic papers can achieve greater clarity and impact [12].

2.2 Application of Large Language Models in Text Summarization

In recent years, large language models (LLMs) have made significant advancements in text summarization. Using deep learning techniques, these models extract key information from long texts and generate concise, coherent summaries, effectively addressing the challenges posed by information overload.

LLMs have demonstrated remarkable performance in news summarization tasks, generating various types of summaries tailored to different journalistic needs. These advancements have provided the media industry with efficient content-processing tools [13].

In the field of education, researchers have developed a lightweight idempotent model framework (IGLM) for text summarization. By employing multi-source training and fine-tuning strategies, this framework significantly enhances summarization accuracy and fluency while maintaining computational efficiency, offering new possibilities for digital education resources and content aggregation [14].

However, in the legal sector, the quality of LLM-generated judicial document summaries remains inconsistent due to a lack of domain-specific knowledge. To address this issue, researchers have integrated prompt learning techniques and structured information templates into Qwen-based LLMs, optimizing their ability to generate summaries that accurately reflect legal document structures and logical relationships [15]. Additionally, domain-specific fine-tuning techniques have significantly improved the quality of legal text summarization, providing valuable support for legal professionals.

LLMs have also demonstrated potential in the automatic summarization of ancient texts. Studies have shown that fine-tuning GPT-3.5-turbo and ChatGLM3 with small datasets can significantly enhance summarization capabilities, opening new avenues for digitalizing traditional cultural texts [16].

From a technical perspective, LLMs have also been utilized to improve static code analysis and summarization [17]. Through few-shot prompt fine-tuning, researchers have enhanced the precision and efficiency of generated summaries, offering valuable tools for software development and code management [18].

3 RESEARCH METHODOLOGY

By systematically analyzing academic papers on the "Digital Economy" topic in the CNKI database, this study evaluates abstract quality and explores the potential of large language models (LLMs) in abstract optimization. The research methodology includes three key components: data sources and sample selection, abstract evaluation criteria, and LLM-based abstract generation and assessment.

First, in terms of data sources and sample selection, this study utilizes CNKI as the primary data source and retrieves academic journal papers using "Digital Economy" as the keyword under the "Subject" category. No restrictions were placed on publication year or discipline to ensure broad coverage. Due to CNKI's retrieval limit of 6,000 records, non-academic documents (e.g., announcements, conference abstracts) were excluded, resulting in a final dataset of 5,054 papers. Most of these papers were published in recent years, making them a representative sample for assessing the overall quality of academic abstracts.

Second, regarding abstract evaluation criteria, a quantitative scoring system was established to assess abstract quality based on four key dimensions: research objective, research methodology, research results, and research conclusions. Specifically, for the research objective, an abstract receives 0 points if it fails to state the research objective, 1 point if the objective is mentioned, and an additional 1 point if the objective closely aligns with the paper's title. For the research methodology, 0 points are assigned if the methodology is not mentioned, 1 point if it is included, and an additional 1 point if the methodology is appropriately aligned with the research objective. For the research results, 0 points are assigned if results are absent, 1 point if they are mentioned, and an additional 1 point if they logically align with the chosen methodology. Finally, for the research conclusions, 0 points are assigned if the abstract lacks conclusions, 1 point if conclusions are mentioned, and an additional 1 point if they logically follow from the research

results. The scoring process strictly adheres to these standards to ensure objective and consistent evaluation across all sample abstracts.

Finally, in terms of LLM-based abstract generation and assessment, this study selected 30 papers with severely deficient abstracts, particularly those lacking descriptions of research methodology, results, and conclusions. The full texts of these papers were obtained, and abstracts were regenerated using Tongyi Qianwen 2.5 via its web interface. The model was prompted to generate new abstracts covering all four key dimensions: research objective, methodology, results, and conclusions. After generation, experienced editors assessed the quality of these LLM-generated abstracts, focusing on structural completeness and the accuracy of information extraction. The performance of LLM-generated abstracts was then compared against the original abstracts to evaluate the model's effectiveness in improving abstract quality.

4 RESEARCH RESULTS

Through a scoring analysis of 5,054 academic paper abstracts, it was found that significant deficiencies exist in structural completeness and information conveyance, particularly in the descriptions of research methodology and research results. Regarding the research objective dimension, only two abstracts lacked a clear statement of the research objective, accounting for approximately 0.04% of the sample, while seven abstracts (0.14%) had objectives that did not align with the paper's title. Since the vast majority of abstracts included a research objective, further analysis of this dimension was deemed unnecessary. The following sections provide a detailed analysis of the more problematic dimensions and evaluate the performance of LLM-generated abstracts.

4.1 Evaluation Results of Research Methodology Quality

A total of 842 abstracts (16.66% of the sample) failed to include any description of the research methodology. This suggests that a considerable portion of researchers omitted methodological details when writing their abstracts. Furthermore, 1,754 abstracts (34.71%) contained inappropriate or inadequate methodological descriptions. Issues in this category included misalignment between research design and research objectives, improper methodological application, or insufficient explanation of methods used. These two types of deficiencies combined account for 51.37% of the total sample, indicating that more than half of the analyzed abstracts had significant issues in presenting research methodology.

The distribution of these deficiencies is shown in Figure 1, which visually presents the proportion of missing and inappropriate research methodology descriptions within the analyzed abstracts. Notably, the high proportion of issues in this category suggests a widespread need for improvement in how research methodologies are reported in abstracts.

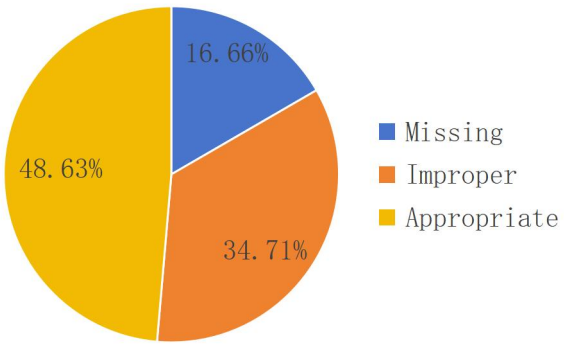

Figure 1 Statistical Analysis of Research Methodology Quality in Abstracts

4.2 Evaluation Results of Research Results Quality

Deficiencies in the research results dimension were particularly pronounced. A total of 1,463 abstracts (28.9%) failed to present research results, meaning that nearly one-third of the sample abstracts did not effectively summarize the core research findings. Additionally, 1,183 abstracts (23.41%) contained results that were misaligned with their stated research methodology. This misalignment suggests that the results either failed to adequately validate the research objective or deviated from the intended research framework.

The combined proportion of abstracts with missing or misaligned results reached 52.31%, demonstrating that research results were the most frequently omitted or misrepresented component in the abstracts analyzed. Figure 2 illustrates the extent of these issues.

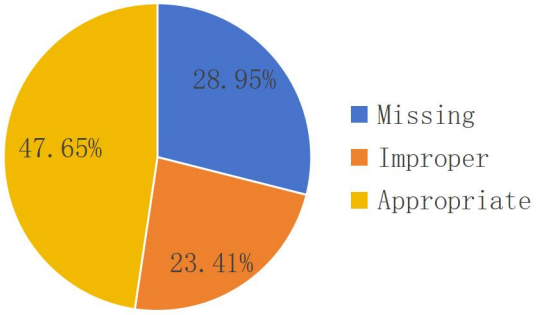

Figure 2 Statistical Analysis of Research Results Quality in Abstracts

4.3 Evaluation Results of Research Conclusions Quality

A total of 561 abstracts (11.10%) failed to provide any research conclusions. This indicates that some researchers neglected to summarize the significance and implications of their findings. Furthermore, 1,153 abstracts (22.81%) contained conclusions that were not logically derived from the research results. These issues highlight deficiencies in the logical rigor of abstract writing, including cases where conclusions were disconnected from the presented findings, where reasoning was insufficient, or where conclusions contradicted the actual data.

The combined proportion of abstracts with missing or logically inconsistent conclusions was 33.91%, as shown in Figure 3. These findings indicate that while some abstracts included research conclusions, many lacked logical coherence, affecting their overall quality.

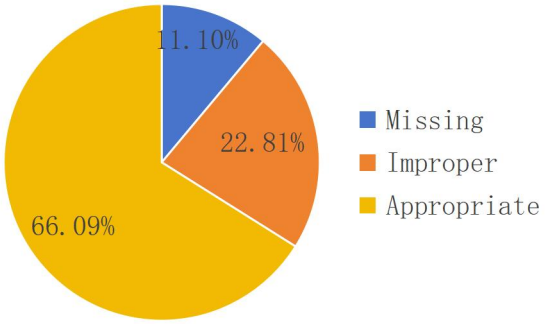

Figure 3 Statistical Analysis of Research Conclusions Quality in Abstracts

4.4 Overall Situation

A total of 3,385 abstracts (66.98%) were structurally complete, meaning they covered research objectives, methodology, results, and conclusions. This suggests that the majority of abstracts formally included the key elements of research reporting. However, only 2,151 abstracts (42.56%) were both structurally complete and logically coherent. This gap indicates that while many abstracts appear complete in structure, they still exhibit significant issues in logical consistency, coherence, and information accuracy.

Figure 4 presents a summary of the overall abstract quality statistics, revealing that 57.44% of abstracts failed to effectively summarize the core research content. This suggests that a substantial portion of academic abstracts require improvement in clarity, logical organization, and completeness.

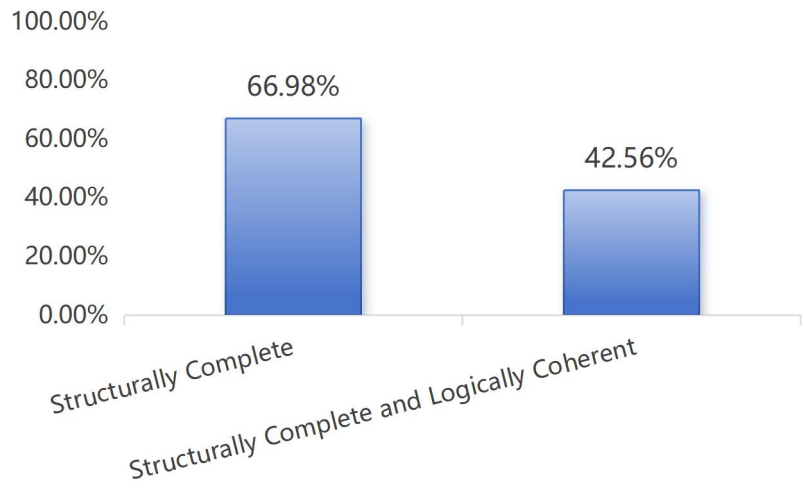

Figure 4 Overall Quality Statistics of Research Abstracts

4.5 Performance of LLM-Generated Abstracts

For the LLM-generated abstracts, Tongyi Qianwen 2.5 was tested on 30 papers with severely deficient abstracts. The regenerated abstracts demonstrated strong capabilities in extracting and structuring information, effectively covering all four key dimensions: research objective, methodology, results, and conclusions. Compared to the original abstracts, the LLM-generated versions were more concise, logically coherent, and free from the common issues of ambiguity and missing information.

Since the LLM-generated abstracts consistently received full scores across all evaluation dimensions, while original abstracts frequently exhibited major deficiencies in methodology, results, and conclusions, graphical comparisons were deemed unnecessary to avoid redundancy in highlighting the evident differences.

5 CONCLUSION

5.1 Discussion and Conclusion

This study systematically analyzed the quality issues of academic paper abstracts in CNKI's "Digital Economy" category and examined the applicability and effectiveness of large language models (LLMs) in abstract optimization. The findings reveal that abstracts in Chinese academic papers commonly suffer from deficiencies in describing research methodology, results, and conclusions. These issues not only hinder the effective conveyance of information but also weaken the dissemination and impact of research findings. Based on the research results, the following key insights are drawn:

First, the description of research methodology is a major weakness in abstract writing, with approximately 51.37% of abstracts exhibiting deficiencies in this dimension. Specifically, some abstracts fail to mention research methodology, while others provide descriptions that do not align with the research objective. The omission or improper selection of methodology undermines the logical structure and scientific rigor of abstracts. The experiment with LLM-generated abstracts shows that the model excels in summarizing research methodology concisely and accurately. This suggests that LLMs can be leveraged to improve the standardization of research methodology descriptions in abstracts.

Second, the research results dimension presents the most significant issues, with more than half of the abstracts either lacking results (28.9%) or containing results that do not align with the methodology (23.41%). Research results are among the most critical elements of an abstract, and their omission significantly diminishes the abstract's ability to summarize the core contributions of the study. LLM-generated abstracts demonstrate a strong ability to extract and structure research results effectively, ensuring that findings are appropriately aligned with the research methodology. This highlights the potential of LLMs in enhancing the completeness and logical coherence of abstract content.

Third, 33.91% of abstracts either lack research conclusions or fail to derive them logically from the research results. These deficiencies suggest that many researchers do not adequately summarize or articulate the significance of their findings in the abstract. LLM-generated abstracts exhibit natural progression from research results to logical conclusions, effectively highlighting the study's contributions and implications.

Overall, 24.42% of abstracts are structurally complete but logically incoherent, indicating that formal completeness alone is insufficient to ensure high-quality abstracts. A well-structured abstract must also maintain logical consistency between the research objective, methodology, results, and conclusions. The experimental results suggest that LLMs perform exceptionally well in improving logical coherence and linguistic clarity. Compared to manually written abstracts, LLM-generated abstracts demonstrate superior logical flow and conciseness, providing a viable approach for enhancing the overall quality of academic abstracts.

Based on these findings, this study concludes that the writing of academic abstracts in China exhibits significant deficiencies in describing research methodology, results, and conclusions. These issues necessitate technical

interventions for improvement. LLMs have demonstrated remarkable capabilities in abstract optimization, enhancing not only content completeness but also logical consistency and language precision. Even without fine-tuning, existing LLMs can generate high-quality abstracts. Therefore, academic abstract writing should incorporate LLMs to improve quality. However, it is also essential to acknowledge that the effectiveness of LLM-generated abstracts depends on the accuracy and completeness of the original paper content.

5.2 Limitations and Future Research Directions

Despite confirming the potential of LLMs in abstract optimization, this study has certain limitations. First, the sample is limited to academic papers in the "Digital Economy" domain, and the applicability of the findings needs further validation across other academic disciplines. Second, the study exclusively tested Tongyi Qianwen 2.5 without comparing other LLMs, leaving room for further comparative research. Third, human evaluation of abstract quality may introduce subjective biases.

Future research can be expanded in several directions. First, a broader range of disciplines should be analyzed to assess the generalizability of the findings. Second, multiple LLMs should be compared to explore the potential benefits of integrating different models for abstract generation. Third, automated abstract quality assessment tools should be developed to enhance evaluation accuracy and efficiency. Finally, LLM-generated abstracts should be integrated into academic publishing workflows to promote the adoption of intelligent tools and improve the efficiency and effectiveness of scholarly communication.

In conclusion, this study confirms the value of LLMs in optimizing academic abstracts, identifies key pathways for improving abstract quality in Chinese academic writing, and provides new perspectives on the intelligent development of scholarly communication. As LLM technology continues to advance, it is expected to become an indispensable tool in academic research and knowledge dissemination.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

REFERENCES

[1] Fu T, Ma J, Shao W, et al. Analysis of translation issues and discussion on writing methods of structured English abstracts in medical papers. Sci & Tech Communication, 2024, 16(1): 73-76+80.
[2] Wei J. Major problems and countermeasures in the writing of academic paper abstracts. J Guangxi Univ (Philos Soc Sci Ed), 2008, 30(6): 136-139.
[3] Zhang C, Niu X, Sun J, et al. Exploration of ChatGPT: Opportunities and challenges for academic publishing under large AI language models. Chinese J Sci Technol Stud, 2023, 34(4): 446-453.
[4] Wang X, Yuan W. On the standardization of academic paper abstract writing. J Xi'an Univ Posts Telecommun, 2007, (6): 146-148.
[5] Zhao G. On the standardized writing and arrangement of academic paper abstracts and keywords. Educ Cult Forum, 2022, 14(3): 105-108.
[6] Wei J. Major problems and countermeasures in the writing of academic paper abstracts. J Guangxi Univ (Philos Soc Sci Ed), 2008, 30(6): 136-139.
[7] Guo W. Common problems and solutions in academic paper abstract writing. Sci & Tech Communication, 2018, 10(10): 154-157.
[8] Zhou L. Common problems in scientific paper abstracts and the art of writing. Sci & Tech Communication, 2022, 14(16): 37-39.
[9] Wang H. Essentials and common issues in scientific paper abstract writing. J Xi'an Shiyou Univ (Nat Sci Ed), 2009, 24(1): 100-102.
[10] Zhang F, Zhou W. Common problems and modification strategies for Chinese scientific paper abstracts. Chinese J Sci Technol Stud, 2009, 20(4): 744-745.
[11] Anstey A. Writing style: abstract thoughts. Br J Dermatol, 2014, 171(2): 205-206.
[12] Ma Q. Editors should pay attention to the writing and standardization of paper abstracts. J Northwest Minzu Univ (Philos Soc Sci Ed), 2010, (6): 102-105.
[13] Zhang T, Ladhak F, Durmus E, et al. Benchmarking large language models for news summarization. Trans Assoc Comput Linguist, 2024, 12: 39-57.
[14] Yang X, Ma B, Li S, et al. A method for power-equal abstracts of educational texts based on large language models. Comput Eng, 2024, 50(7): 32-41.
[15] Li J, Huang R, Chen Y, et al. A method for summarizing judicial documents combining prompt learning and Qwen large language models. J Tsinghua Univ (Sci Technol), 2024, 64(12): 2007-2018.
[16] Wu N, Liu C, Liu J, et al. AIGC-driven research on ancient books automatic summarization: From natural language understanding to generation. Libr Forum, 2024, 44(9): 111-123.
[17] Hu T, Xie R, Ye W, et al. Automatic code summarization enhanced by project context. J Softw, 2023, 34(4): 1695 -1710.

[18] Ding H, Fan Z, Guehring I, et al. Reasoning and planning with large language models in code development. In: Proceedings of the 30th ACM SIGKDD Conference on Knowledge Discovery and Data Mining, 2024, 6480-6490.