A Survey on the Usefulness of ChatGPT as a Modern Tool for Research in China

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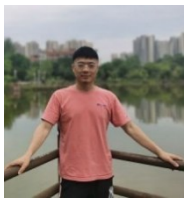

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Abstract

ChatGPT is famous for assisting in research, among other AI-generated research assistance modules. It is being updated and its users are getting reliable assistance in research work. However, the current study focused on measuring the impact of ChatGPT on academic research, finding theory, data analysis, proofreading, and error identification. The motivation for this research was to contribute knowledge of how ChatGPT is helpful for researchers for university-level scholars in China. Data was collected from scholars working in Chinese universities. Considering the convenience sampling method, a survey-based approach was used to collect data. The study's empirical findings confirmed the significant impact of ChatGPT on academic research, finding theory, data analysis, proofreading, and error identification. This research addressed the gaps in the literature as previously scholarly research has not focused on the phenomena investigated by this research. Hence, this study has some practical implications for advancing the use of ChatGPT for Chinese university-level scholars to improve their research contributions. Chinese universities are recommended to use ChatGPT in their scholarly research work, but careful use is required. Furthermore, the scholars are supposed to acknowledge the use of artificial intelligence (AI) generated tools in research publications.

Keywords

ChatGPT, Artificial Intelligence, Research Writing, Scholarly Research, Research Information.

1. Introduction

Conducting research is time-consuming and challenging for finding a solution to a problem (**Sallam**, 2023b). It is strategically important to understand that conducting research is a time-consuming task requiring additional expertise. Expertise in research methodology, data collection, and analysis is necessary for any researcher (**Rice *et al.***, 2024). However, there is support from the third party in research, which is also recognized as legal when the data collection resources are appropriate. Hence, the research conducting process is as critical as the research writing process (**Khlaif *et al.***, 2023). Reporting research after conducting it correctly is a strategic way to improve the reliability of research work. The skills to write research are as important as the other steps of conducting research. Hence, it must be considered that conducting research is not an easy task, but it takes time and skills (**Kalla; Smith**, 2023).

The introduction of modern tools is helpful for the researchers to analyze the data (**Hosseini *et al.***, 2023). Data analysis is critical for scholars as much as the data collection process is necessary. Data collection and analysis are essential in any research, which is a reliable way to research the findings (**Mojadeddi; Rosenberg**, 2023). When scholars are motivated to report any research data, they should use modern tools to analyze data suitable for assistance. The researchers were introduced to different data analysis modules but struggled with tools useful for the other steps (**Castillo-González**, 2023). Hence, the process of data analysis and data reporting are critical to consider by the researchers for their better research reporting. It is highly recommended that scholars use modern tools to analyze data necessary to improve performance (**Rahman; Watanobe**, 2023).

The emergence of artificial intelligence (AI) has revolutionized the process of research (**Roumeliotis; Tselikas**, 2023; **Yu; Gao**, 2023). The modules provided by AI are functional for analyzing data and proofreading a document. Similarly, AI is also helpful in paraphrasing documents for learning and performance (**Vaishya; Misra; Vaish**, 2023). The scholars must use modern AI tools for their research work. The research journals also accept the publications with the support of AI but with acknowledgements to it (**Fergus; Botha; Ostovar**, 2023). However, the use of AI is also necessary in the process of proofreading a document before the final submission to the journal. The advancement of AI has a game-changing impact on scholars (**Megahed *et al.***, 2024). Meanwhile, there is controversy among scholars regarding the use of AI. Many scholars are using it for their multitasking purposes. Besides, there is a school of thought in scholars who prohibit using AI-generated modules for scholarly research (**Johnson *et al.***, 2023).

ChatGPT is famous for assisting in research, among other AI-generated research assistance modules. It is being updated and its users are getting reliable assistance in research work. However, the current study focused on measuring the impact of ChatGPT on academic research, finding theory, data analysis, proofreading, and error identification. The motivation for this research was to contribute knowledge of how ChatGPT is helpful for the researchers for university level scholars in China. This research addressed the gaps in the literature as previously scholarly research has not focused on the phenomena investigated by this research. Hence, this study has some practical implications for advancing the use of ChatGPT for Chinese university-level scholars to improve their research contributions. The rest of the study is based on critical sections, including the literature review, methodology, data analysis, discussion, implications, and limitations.

2. Review of Literature

The use of AI-based supporting modules is essential for academic research (**Huang; Tan**, 2023). The information provided by AI-based modules is critical for scholars to understand the research phenomena. AI-based modules are designed to help scholars in their research work which are required to improve the behaviour of scholars (**Huallpa**, 2023). Furthermore, AI-based modules assist in research work, which are helpful for scholars to use for positive purposes. The use of AI-based modules is necessary because scholars can adopt the intelligent way of research (**Rahman *et al.***, 2023). The effective development of AI-based modules is helpful for scholars to improve their learning performance critically. The information provided to the scholars is necessary for their sustainable working, but they can use AI-based modules to get assistance in research (**Eysenbach**, 2023). The purpose of these scholarly modules is to provide helpful information to scholars. Using AI-based modules in academic research can save time because an intelligent way of working is possible (**Sallam**, 2023a). However, scholars should carefully use AI-based modules as they can also provide biased and misleading information (**Lecler; Duron; Soyer**, 2023). Therefore, scholars are not required to use these AI-based modules blindly, but careful working is needed.

Hypothesis 1: ChatGPT is useful in academic research.

AI-based modules are helpful for scholars to analyze extensive documents (**Khlaif *et al.***, 2023). The use of AI-based modules is helpful for scholars to summarize the information for better conceptualization and understanding. Scholars must understand the scholarly work with proper conceptualization, which is now possible with AI-based modules (**Gao *et al.***, 2023). Developing AI-based modules is an intelligent way to assist scholars because information findings have become easy for them. Previously, scholars manually found information by reading different documents (**Rasul *et al.***, 2023). Still, with the advancement of AI-based modules, it has become easy for scholars to get the information in other chunks. Similarly, the scholars are also motivated to improve their information and process development which is necessary for their stable working. The information management and conceptualization process has become easy with AI-based modules, and scholars widely use ChatGPT for this purpose (**Chatterjee *et al.***, 2023). The finding of research supportive theory has become an easy process for scholars with the help of AI-based modules (**Ruksakulpiwat; Kumar; Ajibade**, 2023). The analysis of information related to the alternative theories is also a great feature of ChatGPT and other AI-based modules (**Janssen; Kazemier; Besselink**, 2023).

Hypothesis 2: ChatGPT is useful in findings theory.

The process of data analysis is critical in any research work. The accuracy of data analysis is necessary for the reliable and factual findings in the research work (**Cascella *et al.***, 2023). The expertise of the scholars is required for the data analysis process because it is complex without proper skills. Many scholars used third-party support for the data analysis process, making it possible for them to reach the research results (**Garg *et al.***, 2023). However, advancing AI-based modules is a valuable way of data analysis. It makes it easier for people to analyze the data. The working of ChatGPT and other AI-based modules also supports the scholars in the data analysis process (**Tabone; de Winter**, 2023). The scholars must analyze data properly by confirming its accuracy with AI-based modules. It is an effective way to proceed with the research to analyze research data with AI-based modules, and provide findings related to the AI tools (**Shihab; Sultana; Samad**, 2023). However, it is also the responsibility of the scholars to give acknowledgement to AI-based modules which is used for the analysis of data (**Lo**, 2023). Many researchers use the development of AI for data analysis, which is also a way forward for them to do this process confidently (**Kieser *et al.***, 2023).

Hypothesis 3: ChatGPT is helpful in data analysis.

The AI-based modules are based on different language-based programs (**Shidiq**, 2023). The scholars must analyze the information critically. The use of AI-based modules in proofreading the documents is also essential. The AI-based modules help summarize the documents by highlighting their mistakes (**Sedaghat**, 2023). It is easy for scholars to find the problems and grammatical issues in the document with the help of AI. Furthermore, AI-based modules are helpful for the language improvement of the papers (**Lund; Wang**, 2023). It is necessary for a scholarly contribution to improve its language and working attitude. The assistance of AI-based modules is helpful for scholars to proofread documents (**Strzelecki**, 2023; **Haseeb; Hartani**, 2023). However, scholarly contributions are important for the scholars for their reliable work. The process of proofreading with AI-based modules is easy because it highlights the changes in the language of the document (**Sharma; Yadav**, 2022). However, human involvement is also necessary to confirm the proofreading because AI-based modules can change the nature of work, affecting the efficiency and effectiveness of language-based work. The reliability of AI-based modules is established as scholars used these modules for proofreading (**Guleria *et al.***, 2023). However, it is also necessary for the scholars to properly acknowledge it.

Hypothesis 4: ChatGPT is useful in proofreading.

Scholarly works are supposed to be error-free because errors in these works can lead to misleading conclusions and findings (**Lund *et al.***, 2023). Therefore, using AI-based modules is also necessary for scholars to improve their work. Identifying mistakes in any scholarly work is essential for prompt actions to improve the quality of work (**Wang *et al.***, 2023). The scholars must use the third-party support of AI-based modules to identify errors in their work. It is a way for scholars to improve their work and contribution to the knowledge (**Kitamura**, 2023). When a scholarly work is full of errors, it becomes difficult to publish it. Similarly, the scholar's reputation is also questionable when they produce a work full of errors (**Ngo**, 2023). Therefore, the use of AI-based modules is necessary for scholarly contributions for effective performance and working. The use of AI-based modules can identify the mistakes in the work of scholars, and the recommendations to eliminate them are also possible (**Bin-Nashwan; Sadallah; Bouteraa**, 2023). Hence, scholars should appropriately consider the revolution of AI-based modules to understand the scholarly contribution better (**Limna *et al.***, 2023).

Hypothesis 5: ChatGPT is useful in error identification.

3. Methodology

The research design of this study was quantitative because a survey-based approach was used to collect data to determine the findings. This research used a Likert scale questionnaire for the collection of data. However, the current study developed the scale items used to measure the relationship between variables. The previous studies were evaluated to find a valid scale for measuring the variables, but the scale's operationalization was different. Therefore, a comprehensive process of scale developed was used in this research. The process was followed in various steps to establish scale items. In this scale development process, the literature was reviewed to understand the proper conceptualization of the variables used in this research. Furthermore, a pool of the scale items was created based on each variable. These scales were considered for the collection of data for the pilot study. However, a team of scholars was contacted to determine this research's face and content validity. The scholars were motivated to determine the items' content and language validity. The modifications recommended by the scholars were considered to improve the developed scale.

The pilot study with empirical data was also considered for measuring the validity of the research scale. The population of this study were scholars working in different universities in China. A sample of 49 respondents was collected for confirmation of the validity of the questionnaire. The findings of confirmatory factor analysis and exploratory factor analysis were considered for data analysis. The findings confirmed that the developed scale was reliable in measuring the relationship between variables. Hence, the external reviewers and quantitative data established the validity of the developed scale items. Finally, the process of final data collection was started, and scholars from the universities in Wuhan, Shanghai, and Beijing were contacted. The convenience sampling method was applied to collect data, which was critically considered for the findings. The process was used because the convenience of the respondents was prioritized. A survey-based approach was used in data collection because this approach was appropriate for collecting data on the Likert scale. Seven hundred printed questionnaires were distributed to the respondents, but responses were collected from only 617. The preliminary analysis was conducted, and valid 609 responses were considered appropriate for data analysis. The study used the Partial Least Square – Structural Equation Model (PLS-SEM) for findings. The findings were determined by measurement model assessment and structural model assessment process of data analysis using Smart PLS 4.

4. Findings

The findings of descriptive statistics were tested at the initial stage to confirm the normality of the data. It is necessary to confirm the normality of data before the findings are based on further analysis. The missing values in the data were tested, and the study found no missing values. Furthermore, all responses were considered valid for this research. Accordingly, the findings of skewness and kurtosis were also tested. The process of skewness and kurtosis is tested to confirm if the data is normal or skewed. The threshold for skewness and kurtosis +3 and -3 was considered to confirm the skewness and kurtosis (**Royston**, 1992). The results shown in Table 1 confirmed that the study data was normal.

Table 1: Descriptive Statistics.

No.	Items	Missing	Mean	Median	Min	Max	Standard Deviation	Excess Kurtosis	Skewness
1	CGPT1	0	3.958	4	1	5	0.976	0.582	-0.901
2	CGPT2	0	3.71	4	1	5	1.093	-0.324	-0.596
3	CGPT3	0	3.615	4	1	5	1.175	-0.583	-0.567
4	CGPT4	0	4.078	4	1	5	0.992	0.967	-1.14
5	CGPT5	0	4.173	4	1	5	0.846	1.757	-1.148
6	AC1	0	3.88	4	1	5	1.083	-0.227	-0.783
7	AC2	0	3.82	4	1	5	1.197	-0.448	-0.753
8	AC3	0	3.686	4	1	5	1.154	-0.551	-0.57
9	AC4	0	3.746	4	1	5	1.173	-0.425	-0.668
10	AC5	0	3.806	4	1	5	1.093	-0.28	-0.651
11	FT1	0	3.753	4	1	5	1.091	0.099	-0.744
12	FT2	0	3.961	4	1	5	0.899	1.539	-1.069
13	FT3	0	3.972	4	1	5	1.012	-0.269	-0.704
14	FT4	0	4.141	4	1	5	0.963	0.563	-1.003
15	FT5	0	3.986	4	1	5	0.962	0.136	-0.785
16	DA1	0	3.982	4	1	5	1.003	0.466	-0.935
17	DA2	0	3.604	4	1	5	1.073	-0.309	-0.506
18	DA3	0	3.767	4	1	5	1.054	-0.054	-0.686
19	DA4	0	3.788	4	1	5	1.088	-0.391	-0.645
20	PR1	0	3.71	4	1	5	1.138	-0.409	-0.629
21	PR2	0	3.894	4	1	5	1.021	0.641	-0.928
22	PR3	0	3.852	4	1	5	0.994	0.118	-0.761
23	PR4	0	3.869	4	1	5	0.933	0.121	-0.656
24	PR5	0	3.88	4	1	5	0.882	0.303	-0.572
25	EI1	0	3.65	4	1	5	1.259	-0.777	-0.524
26	EI2	0	3.64	4	1	5	1.251	-0.983	-0.412
27	EI3	0	3.806	4	1	5	1.162	-0.412	-0.688
28	EI4	0	3.809	4	1	5	1.182	-0.765	-0.605
29	EI5	0	3.799	4	1	5	1.235	-0.784	-0.619
30	EI6	0	3.293	3	1	5	1.239	-0.943	-0.225

The findings of factor loadings were tested to confirm the scale items used for measuring the variables are reliable. The factor loadings were determined using the threshold > 0.60 (**Hair *et al.***, 2010). It is helpful to determine which scale is not reliable for the data. The scale items having values less than the recommended threshold should be deleted and not considered in the final analysis. The results shown in Table 2 and Figure 1 confirmed that all scale items were considered reliable in this research.

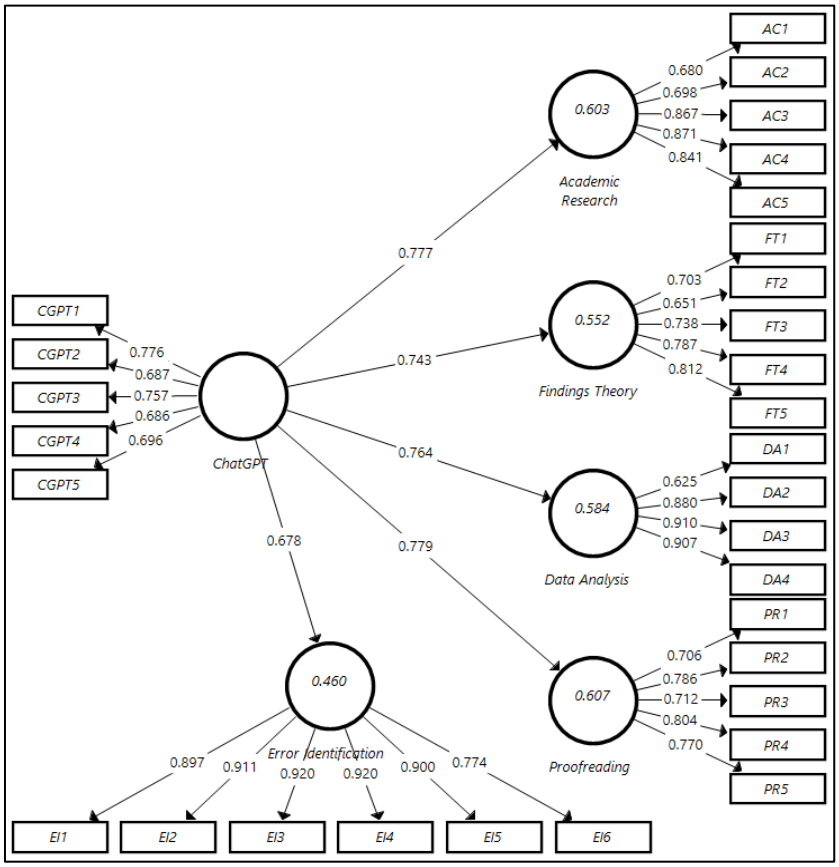

Figure 1: Measurement Model.

Table 2: Factor Loadings.

Variables	Academic Research	ChatGPT	Data Analysis	Error Identification	Findings Theory	Proofreading
AC1	0.68					
AC2	0.698					
AC3	0.867					
AC4	0.871					
AC5	0.841					
CGPT1		0.776				
CGPT2		0.687				
CGPT3		0.757				
CGPT4		0.686				
CGPT5		0.696				
DA1			0.625			
DA2			0.88			
DA3			0.91			
DA4			0.907			
EI1				0.897		
EI2				0.911		
EI3				0.92		
EI4				0.92		
EI5				0.9		
EI6				0.774		
FT1					0.703	
FT2					0.651	
FT3					0.738	
FT4					0.787	
FT5					0.812	
PR1						0.706
PR2						0.786
PR3						0.712
PR4						0.804
PR5						0.77

The convergent validity of the data was tested to measure if the scale items were reliable for data analysis. The convergent validity was tested using Cronbach's alpha, composite reliability, and average variance extracted findings. The Cronbach's alpha and composite reliability values above 0.70 are considered valid (**Tavakol; Dennick**, 2011; **Hayes; Coutts**, 2020). Furthermore, the findings of the average variance extracted above 0.50 are considered significant (**Alarcón; Sánchez; De Olavide**, 2015). The data shown in Table 3 confirmed that all thresholds were achieved. Hence, it was proved that this research data was reliable and valid when collected on scale items.

Table 3: Convergent Validity.

Variable	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Academic Research	0.852	0.895	0.633
ChatGPT	0.77	0.844	0.52
Data Analysis	0.85	0.903	0.704
Error Identification	0.946	0.957	0.789
Findings Theory	0.793	0.858	0.548
Proofreading	0.818	0.87	0.573

The findings of multicollinearity issues in the data were tested with discriminant validity. The purpose of discriminant validity was to confirm the scale items of the study, which are theoretically different. These items are also different empirically. The findings of discriminant validity were measured using the Heteritrait-Monotrait (HTMT) method. The threshold was HTMT values should be less than 0.90 (**Henseler; Ringle; Sarstedt**, 2015). The findings of the HTMT shown in Table 4 confirmed the discriminant validity of the data was established. Hence, there were no multicollinearity issues found in the data.

Table 4: Discriminant Validity.

Variable	Academic Research	ChatGPT	Data Analysis	Error Identification	Findings Theory	Proofreading
Academic Research						
ChatGPT	0.794					
Data Analysis	0.813	0.732				
Error Identification	0.790	0.777	0.774			
Findings Theory	0.878	0.722	0.817	0.699		
Proofreading	0.789	0.634	0.861	0.688	0.823	

The findings of paths were tested using measurement model assessment. The t-statistics were used for the confirmation and rejection of hypotheses. Hypothesis 1 results confirmed that ChatGPT is useful in academic research. Secondly, hypothesis 2 results confirmed that ChatGPT is useful in findings theory. Thirdly, hypothesis 3 results confirmed that ChatGPT is useful in data analysis. Fourthly, hypothesis 4 results confirmed that ChatGPT is useful in proofreading. Finally, hypothesis 5 results confirmed that ChatGPT is useful in error identification. The results of path findings are shown in Table 5 and Figure 2.

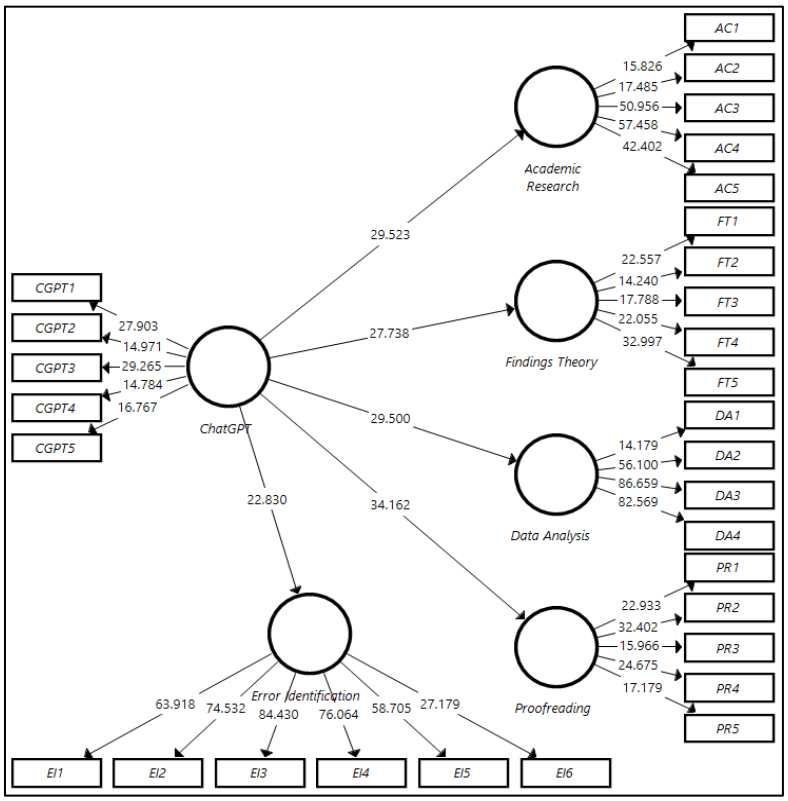

Figure 2: Structural Model.

Table 5: Path Findings.

Paths	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
ChatGPT -> Academic Research	0.777	0.780	0.026	29.523	0.000
ChatGPT -> Data Analysis	0.764	0.764	0.026	29.500	0.000
ChatGPT -> Error Identification	0.678	0.680	0.030	22.830	0.000
ChatGPT -> Findings Theory	0.743	0.744	0.027	27.738	0.000
ChatGPT -> Proofreading	0.779	0.779	0.023	34.162	0.000

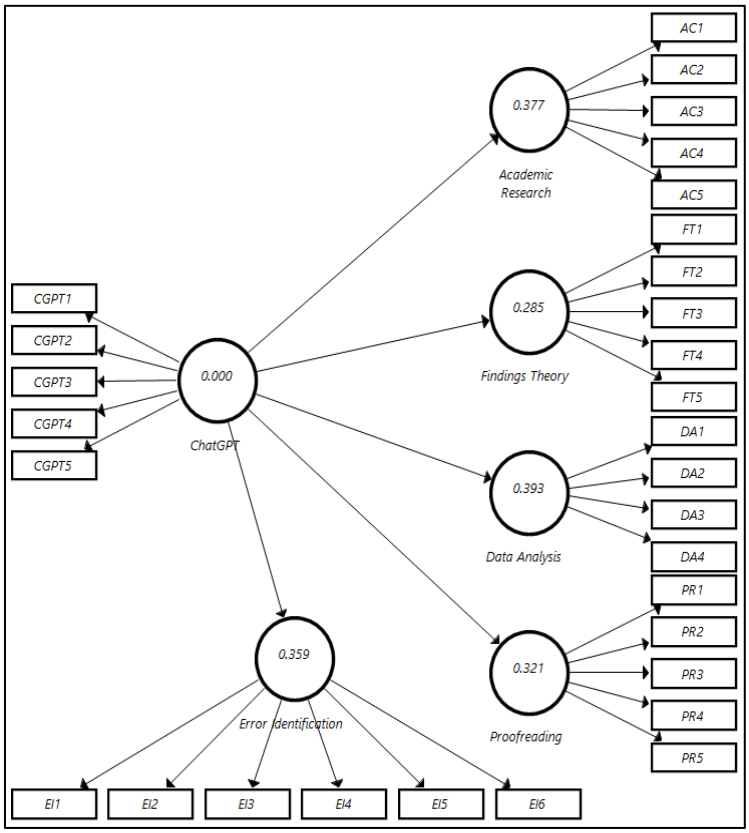

Figure 3: Predictive Relevance.

The findings of predictive relevance were tested to measure the model's predictive power. The results of predictive relevance (Q^2) above 0 are considered significant. The data shown in Table 6 confirmed that the predictive relevance was significant for this research.

Table 6: Predictive Relevance.

Variable	SSO	SSE	Q^2 (=1-SSE/SSO)
Academic Research	1415	881.898	0.377
ChatGPT	1415	1415	
Data Analysis	1132	687.642	0.393
Error Identification	1698	1089.148	0.359
Findings Theory	1415	1011.682	0.285
Proofreading	1415	960.956	0.321

5. Discussion

The study used PLS-SEM for the analysis of data to determine the findings. The findings of this research are a significant contribution to the body of knowledge. Hypothesis 1 results confirmed that ChatGPT is useful in academic research. This relationship's findings were evaluated by comparing previous studies' findings. According to **Wang *et al.*** (2023), for academic research, the usage of AI-based supporting modules is crucial. AI-based modules' data is essential for researchers to comprehend the research phenomena. AI-based modules are made to help academics with their research, which is necessary to enhance academic behaviour. According to **Rice *et al.*** (2024), AI-based modules support research projects that scholars can use to their advantage. According to **Chatterjee *et al.*** (2023), because scholars can embrace the intelligent way of research, AI-based modules are required. The efficient creation of AI-based courses aids students in significantly enhancing their learning outcomes. According to **Lund *et al.*** (2023), the scholars can employ AI-based modules to gain research support, but the information they are given is essential for their sustainable working. These academic modules are meant to provide scholars with relevant information. According to **Rahman *et al.*** (2023), AI-based modules enable intelligent working, their fair application in academic research can save time. According to **Roumeliotis and Tselikas** (2023), scholars should employ AI-based modules with caution as they can also present inaccurate and biased material. Thus, the researchers must employ these AI-based modules carefully rather than mindlessly.

Secondly, hypothesis 2 results confirmed that ChatGPT is useful in findings theory. This relationship's findings were evaluated by comparing previous studies' findings. According to **Rahman and Watanobe** (2023), AI-based modules facilitate the analysis of large documents by scholars. Scholars find that using AI-based modules to summarize the material aids in better conceptualization and comprehension. According to **Kasneci *et al.*** (2023), AI-based modules have made it feasible for researchers to comprehend scholarly work with appropriate conceptualization, which is currently required. According to **Kitamura** (2023), creating AI-based modules is a clever method to support scholars since it has made information retrieval easier. The development of AI-based modules has made it easier for scholars to obtain information in various chunks. According to **Sallam** (2023a), scholars had to manually find information by reading multiple papers. According to **Guleria *et al.*** (2023), scholars are driven to enhance the information and process development they use, as it is essential to their consistent operation. With AI-based modules, managing and conceptualizing knowledge has become simple, and researchers frequently employ ChatGPT. According to **Mijwil; Aljanabi, and Ali** (2023), with the use of AI-based modules, researchers can now access research-supporting theory with ease. Another fantastic aspect of ChatGPT and other AI-based modules is examining data about alternative ideas.

Thirdly, hypothesis 3 results confirmed that ChatGPT is useful in data analysis. This relationship's findings were evaluated by comparing previous studies' findings. According to **Vaishya *et al.*** (2023), in each research project, the data analysis procedure is essential. Accurate data analysis is necessary to produce credible and factual conclusions for the research project. According to **Lund and Wang** (2023), the process of analyzing data requires the knowledge of scholars because it is complex without the right abilities. Many academics employed outside assistance during the data analysis, enabling them to arrive at research findings. According to **Gao *et al.*** (2023), the development of AI-based modules is a helpful approach to the data analysis process. It facilitates people's ability to analyze the data. According to **Sedaghat** (2023), the way that ChatGPT and other AI-based modules function helps scholars with the data analysis process as well. It is necessary for scholars to properly analyze data by using AI-based modules to verify its accuracy. According to **Kieser *et al.*** (2023), using AI-based modules to analyze research data and present findings about AI tools is an efficient technique to move forward with the study. According to **Fergus *et al.*** (2023), scholars also need to acknowledge AI-based modules that are utilized in data analysis. Many academics employ AI advancements.

Fourthly, hypothesis 4 results confirmed that ChatGPT is useful in proofreading. This relationship's findings were evaluated by comparing previous studies' findings. According to **Cascella *et al.*** (2023), various language-based programs serve as the foundation for the AI-based modules. The scholars must critically analyze the information. It's also crucial to use AI-based modules for document proofreading. According to **Cooper** (2023), the AI-based modules aid in their summary by emphasizing the errors in the documents. With the aid of AI, it is simple for academics to identify the

mistakes and grammatical faults in the work. According to **Hosseini *et al.*** (2023), AI-based modules are also helpful for improving the texts' language. An academic contribution must have better terminology and an improved approach to work. According to **Gupta *et al.*** (2023), the scholars find it beneficial to have AI-based modules help them proofread their documents. However, using academic contributions is crucial for scholars to ensure dependable work. AI-based proofreading modules simplify identifying linguistic changes in a document by highlighting them. According to **Megahed *et al.*** (2024), as AI-based modules can alter the character of works, human involvement is also required to confirm the proofreading. This is because language-based working can become less efficient and effective. According to **Budhwar *et al.*** (2023), because academics used these AI-based modules for proofreading, their dependability has been demonstrated. On the other hand, the scholars feel it must also be appropriately acknowledged.

Finally, hypothesis 5 results confirmed that ChatGPT is useful in error identification. This relationship's findings were evaluated by comparing previous studies' findings. According to **Mojadeddi and Rosenberg** (2023), scholarly publications are expected to be free of errors since mistakes might cause misinterpretation of conclusions and findings. Thus, for scholars to better their work, they must also apply AI-based modules. According to **Castillo-González** (2023), any scholarly work must identify its faults to take the necessary immediate measures to raise the work's quality. According to **Ngo** (2023), the usage of AI-based third-party support modules by scholars is essential to detect faults in their work. It is a means by which scholars might advance in their work and knowledge contribution. According to **Wang *et al.*** (2023), getting a scholarly work published gets challenging when it has a lot of errors. Similarly, when a scholar produces a work riddled with mistakes, their reputation is likewise called into doubt. According to **Kasneci *et al.*** (2023), the employment of AI-based modules is required for scholarly contributions necessary for efficient operation and performance. According to **Sallam** (2023a), AI-based modules can be used to find mistakes in academic writing and provide suggestions for how to fix them. Consequently, researchers should consider the revolution in AI-based modules to grasp the scholarly contribution better.

5.1. Implications

The findings of this study have significant implications in the literature. The study contributes to the literature that ChatGPT is necessary for scholarly research. The use of ChatGPT for academic research can be used for the finding of research theory. However, this is new information in the body of knowledge as previously, the studies lack discussion on it. The information regarding using ChatGPT for scholarly purposes is less discussed in previous studies, which is necessary for academic contribution. Furthermore, the study contributes to the knowledge that ChatGPT is essential for data analysis. Hence, this information is also new in the literature because previously no significant study highlighted this relationship in this context. Besides, the study reported that ChatGPT is also used to proofread the research document. There was no scholarly discussion to highlight this relationship in the literature. Hence, this is a significant contribution to the literature by this research. Meanwhile, the study reported that ChatGPT is also necessary to identify errors in research work. Hence, it is also a significant contribution to the knowledge less discussed by the previous studies. Therefore, the literature is improved by the contribution of this research findings.

The findings of this research provide practical recommendations for using ChatGPT for research. The study highlighted that ChatGPT effectively supports the researchers in their scholarly work. The study pointed out that the AI-based modules, including ChatGPT, are practical for literary works, but there must be human verification of ChatGPT-produced content or evaluated data. It is necessary to use ChatGPT for academic research-related purposes which would be helpful to improve the understanding of researchers. However, the scholarly contributions related to the research must also be enhanced with ChatGPT, which is a way forward for research. However, the scholars can analyze data using ChatGPT, but they must verify it with human involvement. It is necessary to understand that AI-based modules are at the development and improvement stage, and there are chances of errors. Hence, it is essential to develop ChatGPT for compelling research purposes to develop findings, but there must be acknowledgement to use it in the scholarly work. Therefore, the scholars must use ChatGPT and other AI-based modules to improve their research work, which would be effective for them to contribute to the literature in a scholarly way.

5.2. Limitations

Despite the significant contributions of this research to the body of knowledge, the findings of this study have some limitations. The first limitation of this study is that it analyzed data using the PLS-SEM method using Smart PLS 4. However, this approach is common in scholarly works, and scholars must use new techniques for the findings. Hence, the studies in the literature are required to analyze data using modern tools such as RStudio. Secondly, this study has limitations as it collected data on a newly developed scale that other studies do not use widely. Hence, the scholars must use the developed scale in future studies to validate it. Therefore, it would be a significant addition to contribute to the validity and reliability of the newly developed scale. Thirdly, the study tested the ChatGPT as an independent variable, but no variable was considered mediating and moderating. Future studies must test mediating and moderating variables to contribute further knowledge to the literature. The future directions of this research are noteworthy, which would be a significant addition to close the loops in literature.

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