A Quantitative Evaluation of the Application of Online Database Systems and Information Communication in Academic Research

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Abstract

The current research is based on a quantitative evaluation of the application of online database systems and information communication in academic research. The study determined the impact of user experience, information retrieval efficiency, training and support on research productivity of scholars. The moderating role of digital literacy was also investigated in this research. A sample of 474 respondents was used in this study and data was analyzed using RStudio. The study investigated that user experience, information retrieval efficiency, training and support have a significant impact on research productivity of scholars. Furthermore, the research confirmed that digital literacy significantly moderates the impact of user experience, information retrieval efficiency, training and support on research productivity of scholars. The findings of this research fills the gaps in literature. Practitioners, policymakers and universities management have significant contributions by this research to improve the body of knowledge.

Keywords

Information Communication, Online Databases, Academic Research, Information Retrieval.

1. Introduction

In the academic research, there is an important role of data management and literature. The literature is based on the findings and discussion of other scholars that help one scholar to understand the communication by other scholars. It is a scholarly discussion among the group of scholars that are working on any specific area of research (**Rafiq *et al.***, 2021). However, the scholarly communication between the researchers is based on their published work. Traditionally, there was a hard form of data management here the printed version of the published work was and distributed to the scholars by the libraries (**Winata *et al.***, 2021). However, with the change of time and technological advancement, the online management of data is established which helped the scholars to brew their understanding about the literature. It is a significant way for the scholars to get access to the reliable information in single click (**Qin *et al.***, 2020). However, the technical knowledge to collect this information from online databases is important for the scholars.

The students working in the universities of China are working on research in both theoretical and applied sciences. However, the researchers are required to access the information that is available on the online resources (**Zawacki-Richter**, 2021). It is important for the scholars to get significant information which help them to improve their productivity. When the scholars are motivated to share the information, they are required to consult with the online databases to retrieve the information (**Papamitsiou *et al.***, 2021). The young scholars are facing challenges as they are not appropriately introduced how online databases work. Therefore, it is important to train the scholars for productivity which is possible by improving their access to online information (**Nilashi *et al.***, 2022). It is one of the factors that can

help the scholars to improve their recent productivity, but they should be passionate about it. When the scholars are working to improve their learning, they are required to work on they're learning to retrieve data from online resources (**Higuchi *et al.***, 2023). In this way, it is found that that is that productivity of the Chinese university scholars is compromised if they have limited knowledge to get the information from online database system.

The scholars discuss that it is not a critical task to collect data from the online database system, but a significant level of training is required (**Chen; Huang**, 2021). However, that duly enrolled researcher faces the challenge is to collect data from the online resources. There should be a mechanism for that do researchers to understand the way they can collect data from the online resources (**De Nardis *et al.***, 2022). Therefore, to meet the challenge of collecting data from online resources which are mostly available in English language and the researchers should be trained for collecting the data from the right resource (**Horita *et al.***, 2021). The training by the universities is important for students to understand the way they can collect data from the online resources. However, Chinese students are facing challenges to collect the data from online resources as they have limited training (**Nishimura *et al.***, 2021). At the same time, the technical support to the researchers for collection of online data is also important to improve their understanding of data (**Mehrolia *et al.***, 2021).

To address the knowledge gaps and practical issues with researchers, the current research is based on a quantitative evaluation of the application of online database systems and information communication in academic research. The study determined the impact of user experience, information retrieval efficiency, training and support on research productivity of scholars. The access to digital library is important for scholars working in different universities and labs. The literature published by the previous researchers helped the scholars to understand the phenomena they are going to address their research. If any information is available already, the researchers are required to change their topic of research. However, advancements in research are hard to be possible with discussion of the scholars where they are understanding any topic or problem. Research is based on a problem, and it is important for the scholars to understand if published works by other scholars have already contributed to the same area of research. In literature, the evidence is available for scholars to understand any phenomenon which can help them to improve their understanding and productivity of any research topic.

This research is novel in the body of knowledge as it has discussed the idea that are previously neglected by scholars. In the existing studies, there are gaps in literature and the scholars have failed little attention to understand the research productivity in the presence of moderating role of digital literacy. The contribution of this research makes it a significant contribution to understanding the phenomenon of how the new researcher can understand the use of digital libraries. In the context of China, this study has contributed into knowledge for the use of online databases to retrieve the contribution of the researchers that can help to improve the productivity. The policymakers and practitioners can benefit from the findings of this research that will be helpful for them to implement. On the other hand, universities in different other countries can also benefit from their finding to provide digital literacy to the scholars for their recent productivity.

2. Literature Review and Hypotheses

Digital literacy is considered as a significant factor which can help the scholars to understand the problem, they are dealing with to improve their scholarly contribution (**Meng *et al.***, 2023). Furthermore, digital literacy is important for scholars to understand the way they can have access to online libraries that are new for free for their productive performance in research. It is critical for the scholars to understand different phenomena in the research and provide their scholarly contribution that can help them to improve their study (**Ciampa *et al.***, 2023). The scholars are recommended to understand the use of online databases to retrieve the data for their research purpose. Similarly, if the scholars have limited technical knowledge, the other scholars are recommended to contribute and provide a significant knowledge to their group mates for their better scholarly understanding (**Pegalajar Palomino; Rodríguez Torres**, 2023). In this way, that digital literacy helpful based on the technical knowledge to the scholars which they can avail for their contributed in knowledge. However, the researchers are recommended to improve their understanding for digital literacy and knowledge that can help them to improve the productivity (**Kabakus *et al.***, 2023).

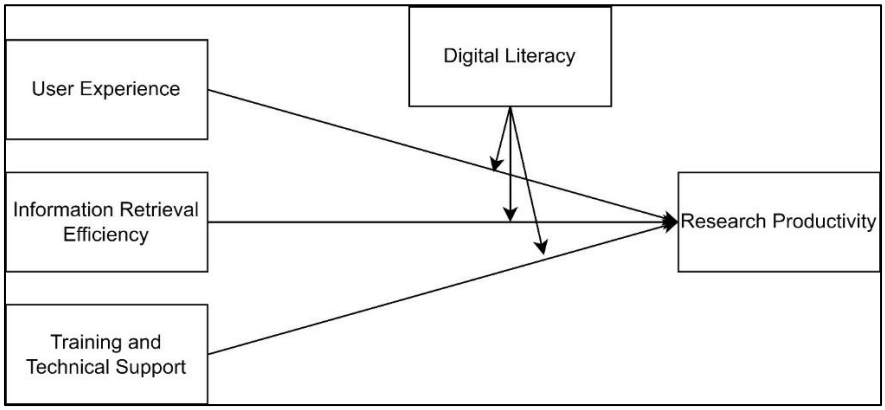

Figure 1: Model of Research.

The model of this study is based on three kinds of variables: the independent variables, that dependent variable a moderating variable. The independent variables are user experience, information retrieval efficiency and training and technical support. Whereas the research productivity is dependent variable while digital literacy is moderating variable. The model is illustrated in Figure 1. The experience of user regarding online database system is important in conducting of research (**Winata *et al.***, 2021). Based on this experience, the researchers can access to online database system in a very easy way. When the researchers are introduced to the online database system, it helps them to retrieve the information that is required for them to conduct their research (**Fidas *et al.***, 2023). Online database is the source of knowledge, and the researchers should have appropriate knowledge to access the information. Researchers need training to use online databased sponsored by educational institutions (**Cheung *et al.***, 2023). When the scholars gain experience to retrieve data from online source, their learning is improved (**Chansanam *et al.***, 2021). The research methodology class should help the students to provide tutorials for getting data from online source (**Aljumah *et al.***, 2021). In the modern time, it has become necessary for the researchers to get access to the online database which can help them to improve their learning (**Chen; Huang**, 2021). Based on this discussion, the following hypothesis is formulated.

Hypothesis 1: User experience has an impact on research productivity.

It is important for the researchers to get information for retrieval of significant data from online database (**Lee; Fanguy**, 2022). There is a plenty of literature available on the online databases, but the researchers are recommended to collect the supportive and related information. For this purpose, the researchers should learn to retrieve data (**Zhuang**, 2021). It is important for the researchers to improve their productivity in the better way which can help them to get better experience of the shared information and data. The skills and the equations developed to collect the data from online databases help the researchers to improve the productivity of their research (**Dima *et al.***, 2022). Therefore, it is required to have appropriate information related tool retrieval of the data from online resources which can improve the productivity of the researchers. When the researchers are working in the productive approach, they can develop appropriate mechanism to understand the way they can collect quality information from online databases (**Islam; Sheikh**, 2020). It is significant for the researchers to collect data from the online databases which can help them to improve their productivity and efficiency. The lead mechanism for online database is helpful for the researchers to get quality information that is required for their research (**Zhang *et al.***, 2022). When the researchers are highly motivated, they learn the better ways to collect the data from online resources that can help them to improve their recent productivity (**Kato *et al.***, 2021). Based on this discussion, the following hypothesis is formulated.

Hypothesis 2: Information retrieval efficiency has an impact on research productivity.

The training of students is important for getting information from online databases (**Duan; Wang**, 2021). The support to get the information that is right for their research help the researchers to achieve their research objective. However, a significant level of productivity is required for getting information from online databases (**Dalmer; Mitrovica**, 2022). The researchers are required to have appropriate technical knowledge that can help them to retrieve the best information that is closely related to their research (**Fu *et al.***, 2021). The information is available on the database, but it is the skill of researchers the way they collect the information and use into their study. The productivity of the researchers is improved with their technical knowledge and understanding to conduct research (**Zhang *et al.***, 2022). The training of researchers is necessary to influence their behaviour for productivity (**Lund *et al.***, 2023). The technical support to researchers for online database repository helps them to get accurate information in the research (**Papamitsiou *et al.***, 2021). It helps to improve the productivity of researchers when they have access to online data and properly trained for it (**De Nardis *et al.***, 2022). Based on this discussion, the following hypothesis is formulated.

Hypothesis 3: Training and technical support has an impact on research productivity.

Digital literacy has a significant importance in the modern time (**Blom *et al.***, 2020). If the researchers have information about the digital databases, they can develop a positive attitude to collect the data which can help them to improve their productivity (**Deng**, 2022). In this way, they can work smartly to achieve their objective to reach on the online databases and get the required data (**van Rooij *et al.***, 2021). The students should be trained to collect data from online resources which can help them to improve their behaviour for online learning (**Nilashi *et al.***, 2022). It is necessary for the students to utilise the online resources for data collection which can help them to retrieve the quality information that is required for them. When researchers are collecting data appropriately from the right resource, it means they can use the digital technology of the modern time and online databases efficiently (**Krotov; Johnson**, 2023). In this way, the contribution to literature and knowledge by the researchers is improved based on their productive approach in data collection using online resources (**Qin *et al.***, 2020). Based on this discussion, the following hypotheses are formulated.

Hypothesis 4: Digital literacy has a moderating role in the relationship between user experience and research productivity.

Hypothesis 5: Digital literacy has a moderating role in the relationship between information retrieval efficiency and research productivity.

Hypothesis 6: Digital literacy has a moderating role in the relationship between training & technical support and research productivity.

3. Methodology

In social sciences research, some variables are measured with the quantitative data based on primary sources. The variables that are measured by collecting data from the primary sources are important in understanding of the perception and behaviour of the individuals. This study measured the impact of different variables on research productivity of students in China. To data collection, this study used survey-based questionnaire to collect the data. The printed version of the questionnaire was distributed to collect the data from the respondents. However, the questionnaire of this research was based on two sections A and B. The first section was dedicated to collect the demographics information about the participants of this research. However, the second section of this research was dedicated to a Likert scale questionnaire-based items to collect the data from the respondents.

The questionnaire of this research was prepared by taking data from the previous studies. The scale items were taken from the previous studies. However, the adapted instruments for this research were considered reliable based on the data of previous studies. Cronbach alpha value for each instrument was above 0.70 which confirms the instrument is reliable and valid to be used for the future studies (**Sekaran; Bougie**, 2016). The study used a five-point Likert scale to collect the data. A sample of more than 382 respondents is considered valid for analysing the data in social sciences research (**Krejcie; Morgan**, 1970). However, the study distributed 600 questionnaires to collect the data from the primary sources. The information was taken from the participants, and they were informed about the purpose of the study. A random sampling method was employed to collect the data from the students found in the libraries of universities in the city of Chongqing in China.

Based on the collected data, it was found that some of the responses provided by the participants were biassed and not consistent. Therefore, the responses well eliminated from the data and a sample of 474 participants were considered significant for the findings. This research used R studio for the analysis of data based on the guidelines of previous studies in social science (**Murad *et al.***, 2024). The binominal test was performed in this research, the frequency analysis for responses was conducted, the reliability of the instrument was also investigated before the determination of relationships between the variables. In this way, the study worked on robust methodology to determine the relationship between research variables and reach on the finding.

4. Findings and Discussion

In the process of data analysis, the binomial test was performed to determine the demographic characteristics of the respondents. During the analysis, it was found that 196 responded were between 20 to 22 years of age. In addition, the study found that 94 respondents were between 23 to 26 years of age while 136 respondents were in age group of the 27 to 30 years. However, 48 respondents were above 30 years. In the analysis of gender, it was found that 238 respondents were male while 236 respondents were female. The study found that 48 responded well under graduates, 253 responders were postgraduates while 176 responded were working as post doctorates. In the status of student, 97 students were part time students while 377th students were full time students. The demographic findings are reported in Table 1.

Table 1. Binomial Test (n=474)

Variable	Level	Counts	Proportion
Age	20-22 Years	196	0.414
	23-26 Years	94	0.198
	27-30 Years	136	0.287
	Above 30 Years	48	0.101
Gender	Male	238	0.502
	Female	236	0.498
Education	Undergraduates	45	0.095
	Postgraduates	253	0.534
	Post-doctorates	176	0.371
Student Status	Part Time	97	0.205
	Full Time	377	0.795

Furthermore, the frequency of the responses was tested to determine how the respondents provide their answer on a liquid scale questionnaire developed based on a five-point rating scale. The study found that on the instrument for user experience, 17 respondents selected one, 108 participants selected two, 127 respondents selected 3, 128 responded selected four while 94 respondents selected 5. The data is reported in Table 2 which indicate that there was no missing value in the data and a total of sample for user experience scale was based on 474 respondents. The study found that on the instrument for information retrieval efficiency 22 respondents selected one, 123 participants selected two, 120 respondents selected 3, 118 responded selected four while 91 respondents selected 5. The data is reported in Table 3 which indicate that there was no missing value in the data and a total of sample for user experience scale was based on 474 respondents.

Table 2: Frequencies for User Experience.

User Experience	Frequency	Percent	Valid Percent	Cumulative Percent
1	17	3.586	3.586	3.586
2	108	22.785	22.785	26.371
3	127	26.793	26.793	53.165
4	128	27.004	27.004	80.169
5	94	19.831	19.831	100.000
Missing	0	0.000		
Total	474	100.000		

Table 3: Frequencies for Information Retrieval Efficiency.

Information Retrieval Efficiency	Frequency	Percent	Valid Percent	Cumulative Percent
1	22	4.641	4.641	4.641
2	123	25.949	25.949	30.591
3	120	25.316	25.316	55.907
4	118	24.895	24.895	80.802
5	91	19.198	19.198	100.000
Missing	0	0.000		
Total	474	100.000		

Moreover, the study found that on the instrument for training and technical support, 18 respondents selected one, 125 participants selected two, 104 respondents selected 3, 135 respondents selected four while 92 responded selected 5. The data is reported in Table 4 which indicate that there was no missing value in the data and a total of sample for user experience scale was based on 474 respondents.

Table 4: Frequencies for Training and Technical Support.

Training and Technical Support	Frequency	Percent	Valid Percent	Cumulative Percent
1	18	3.797	3.797	3.797
2	125	26.371	26.371	30.169
3	104	21.941	21.941	52.110
4	135	28.481	28.481	80.591
5	92	19.409	19.409	100.000
Missing	0	0.000		
Total	474	100.000		

Finally, the study found that on the instrument for user experience, 17 respondents selected one, 114 participants selected two, 79 respondents selected 3, 143 respondents selected four while 121 responded selected 5. The data is reported in Table 5 which indicate that there was no missing value in the data and a total of sample for user experience scale was based on 474 respondents.

Table 5: Frequencies for Research Productivity.

Research Productivity	Frequency	Percent	Valid Percent	Cumulative Percent
1	17	3.586	3.586	3.586
2	114	24.051	24.051	27.637
3	79	16.667	16.667	44.304
4	143	30.169	30.169	74.473
5	121	25.527	25.527	100.000
Missing	0	0.000		
Total	474	100.000		

In the same way, the finding of descriptive statics was determined an imported in Table 6. According to the findings, the mean value and standard deviation value of all the instrument was significant an achieve the recommended threshold. In this way, the study found that the descriptive data of the research is significant it can be utilised for the further analysis.

Table 6: Descriptive Statistics.

	User Experience	Information Retrieval Efficiency	Training and Technical Support	Research Productivity
Mean	3.367	3.281	3.333	3.500
Std. Deviation	1.141	1.177	1.170	1.208
Shapiro-Wilk	0.900	0.899	0.893	0.876
P-value of Shapiro-Wilk	< .001	< .001	< .001	< .001

The findings of factor loadings and component reliability were tested and reported in Table 7. According to the finding, all constructs achieved the minimum threshold for factor loading which is 0.70 (**Hair *et al.***, 2011). In this way, it was found that all the scale items used in collection of data are significant. Furthermore, the data reported in Table 7 also confirm that the component reliability value for all the construct was above 0.70 which is also above the recommended threshold (**Hair *et al.***, 2011). In this way, all the relationships were significantly accepted.

Table 7: Component Loadings.

	Factor Loadings	Composite Reliability
Information Retrieval Efficiency	0.835	0.702
User Experience	0.834	0.704
Training and Technical Support	0.748	0.740
Research Productivity	0.750	0.897

The coefficient findings were used to determine the relationship between variables of the study with p value less than 0.05 (**Hair *et al.***, 2022). According to findings, user experience has a significant impact on research productivity. The study also found that information retrieval efficiency has an impact on research productivity. The research confirmed that training and technical support has an impact on research productivity. The study found that digital literacy has a significant moderate role in the relationship between user experience and research productivity. According to findings, digital literacy has a significant moderating role in the relationship between information retrieval efficiency and research productivity. While the study found that digital literacy has a significant moderating role in the relationship between training & technical support and research productivity. The results are reported in Table 8.

Table 8: Coefficients.

Hypotheses	Path Coefficient	Standard Deviation	t	p
User Experience	0.207	0.030	5.307	0.000
Information Retrieval Efficiency	0.269	0.055	4.890	0.000
Training and Technical Support	0.384	0.066	5.818	0.000
Digital Literacy*User Experience	0.282	0.068	4.147	0.000
Digital Literacy*Information Retrieval Efficiency	0.126	0.033	3.817	0.000
Digital Literacy*Training and Technical Support	0.487	0.067	7.268	0.000

5. Discussion

According to findings, user experience has a significant impact on research productivity. The findings of this relationship are compared with the findings of other scholars. **Fidas *et al.*** (2023) discussed that the user's experience using online database systems is crucial for conducting research. Consequently, researchers can readily access the internet database system. The introduction of the online database system enables researchers to access the information necessary for their investigations. According to **Lee and Fanguy** (2022), the online database serves as a repository of knowledge, necessitating that researchers possess the requisite expertise to access the material. Numerous colleges offer access to internet databases; nevertheless, students must be trained to extract information from these sources. While **Zhuang** (2021) reported that it is a technical procedure to enhance knowledge from internet resources; however, information regarding databases might significantly assist researchers in augmenting their current output. Researchers must acquire knowledge from professors and colleagues to enhance their grasp of the online database and research-related material. According to **Blom *et al.*** (2020), researchers benefit from enhanced knowledge obtained from online databases, which can augment their productivity. Students should consult experienced users to obtain information beneficial for navigating databases (**Winata *et al.***, 2021).

The study also found that information retrieval efficiency has an impact on research productivity. According to **Krotov and Johnson** (2023), researchers must obtain information for the retrieval of essential data from online databases. A plethora of literature exists in internet databases (**Islam; Sheikh**, 2020); nonetheless, researchers are advised to gather pertinent and helpful material. According to **Chiang *et al.*** (2022), the abilities and equations formulated for data collection from online databases enhance researchers' productivity in their investigations. Consequently, it is essential to possess suitable information retrieval tools for accessing data from online resources, which can enhance researchers' productivity (**Zhang *et al.***, 2022). According to **Zhang *et al.*** (2022), it is essential for academics to gather data from internet databases to enhance their productivity and efficiency. The primary mechanism for online databases assists researchers in obtaining the necessary quality information for their studies (**Cheung *et al.***, 2023).

The research confirmed that training and technical support has an impact on research productivity. According to **Dima *et al.*** (2022), it is critical for students to have appropriate technical support for their learning. The technical support helps students to improve their productivity and performance (**Chiang *et al.***, 2022). It helps students to gain good information that can improve their research (**Chansanam *et al.***, 2021). According to **Fu *et al.*** (2021), research methodology class should be based on technical knowledge drilling to the students. The technical knowledge helps students to improve their learning and critical performance (**Deng**, 2022). A researcher productivity is possible when he is keenly interested to understand the technical knowledge of his field and tools of research (**Lund *et al.***, 2023).

The research confirmed that digital literacy significantly moderates the impact of user experience, information retrieval efficiency, training and support on research productivity of scholars. The skills to get data from online library are useful for students (**Izuagbe**, 2021). According to **Duan and Wang** (2021), the students can use their skills to retrieve data from online source which can improve their learning. However, a minimum level of knowledge and training is required for using online library by students (**Fidas *et al.***, 2023). It develops a positive attitude in students to use digital library (**Aljumah *et al.***, 2021). Online learning is difficult for students, a hands on practice is recommended to learn in better way (**Dalmer; Mitrovica**, 2022).

It is necessary for students to improve their learning which has a significant impact on their performance. According to **Kato *et al.*** (2021), the learning and performance of students is improved based on their decisions to learn digital technology.

5.1. Theoretical and Practical Implications

This study has theoretical contribution in the body of knowledge based on the gaps in the literature. The empirical analysis of this study confirms that research productivity is significantly influenced by the user experience. The findings of this relationship are new addition into the body of knowledge as previous studies paid less attention to determine this relationship. Furthermore, the study contributed to the body of knowledge that information retrieval efficiency is also a significant antecedent of research productivity. This relationship was focused by a low number of researchers and there is lack of empirical evidence regarding this relationship. In addition, the study found that trading and Technical Support is also important factor of research productivity which help a researcher work appropriately. In addition to direct relationships, the study contributed the moderating role of digital literacy in the body of knowledge. At first, the study added into the knowledge that digital literacy have a significant moderating role for the impact of user experience on research productivity. This relationship is quite do in to the body of knowledge. Furthermore, this study highlights that digital literacy voted the relationship between information retrieval of agency and research productivity. This relationship was not investigated prior to this research. Therefore, it is a new addition into the body of knowledge. Finally, this trip study contributes to the body of knowledge that digital literacy moderates the relationship between training and technical support and research productivity. In this way, the contribution of this research is a significant addition to the body of knowledge.

This study has practical value as it recommends the researchers to get significant information from online databases to improve their recent productivity. The study recommended that the experienced user should help the non-experience use it for getting data from online databases which helps them to improve their research work. In addition, this study highlights that there is need for training to retrieve the information from online databases which is a significant factor for the researchers to improve their research productivity in the better way. The findings of this research confirmed that there is a significant role of technical knowledge an appropriate training which can improve the productivity of researcher. It is the responsibility of the educational institutes to improve the productivity of the researchers with the help of technical knowledge and productivity. Apart from the findings, study also highlights the important role of digital literacy which is significant factor to improve the research. The study highlights that research can be productive when the digital literacy related information is available to the students and public. If the students have digital literacy, they can use the online database system for information taking. It is a significant factor to improve students' productivity which can be a way forward for their success in research. Therefore, digital literacy, all together with other factors such as user experience, information retrieval and research training are significant for productivity of the researchers.

5.2. Limitations and Future Directions

There are some limitations of this research which required a significant attention by the future researchers to contribute into the body of knowledge. The study is based on the quantitative data which helps to measure the variable and relationship based on the data collected from the participants. However, quantitative data is limited to provide insight into the findingss. Therefore, the future studies are recommended to work on qualitative data to understand the process of information retrieval for that is searchers from online databases to improve their recent productivity. Secondly, this study collected data from the Chinese universities only which reduces the productivity and performance of the research. Therefore, the future researchers are recommended to collect data from ASEAN countries to compare the findings. It would be a significant factor to fill the contextual gaps in their research through the scholarly discussion regarding the recent productivity.

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Appendix A.

Research Instruments

User Experience

- I have good experience retrieving data from database.
- I believe the data available on online databases is reliable.
- I can easily use online portal to retrieve data.
- I am satisfied with access to data available on online databases.

Information Retrieval Efficiency

- I believe quality of information is available on online databases.
- I trust the information because open sources are available in databases.
- The online database user interface is user friendly to collect the data.
- I can use to data retrieval from any resources.

Training and Technical Support

- I believe training for data collection helps to access the data.
- I keenly trust in technical support to collect data.
- I think a researcher should have technical knowledge to retrieve data from an online source.

Digital Literacy

- I am satisfied that digital literacy and information is available on online platforms.
- I understand that digital literacy is accessible to online users in the library.
- I think digital information is important in data retrieval.
- I have digital literacy to collect data from online platforms that helps in research productivity.

Research Productivity

- Access to online literature helps to improve my research.
- I believe research productivity is important for data management.
- I think literature available on online platforms is useful to achieve productivity in research.
- I can access research materials available on online platforms which helps in advancing in research productivity.